JAN 1 0 1944

PAPER TRADE JOURNAL

JANUARY 13, 1944

PATCH IT UP • WEAR IT OUT • MAKE IT DO

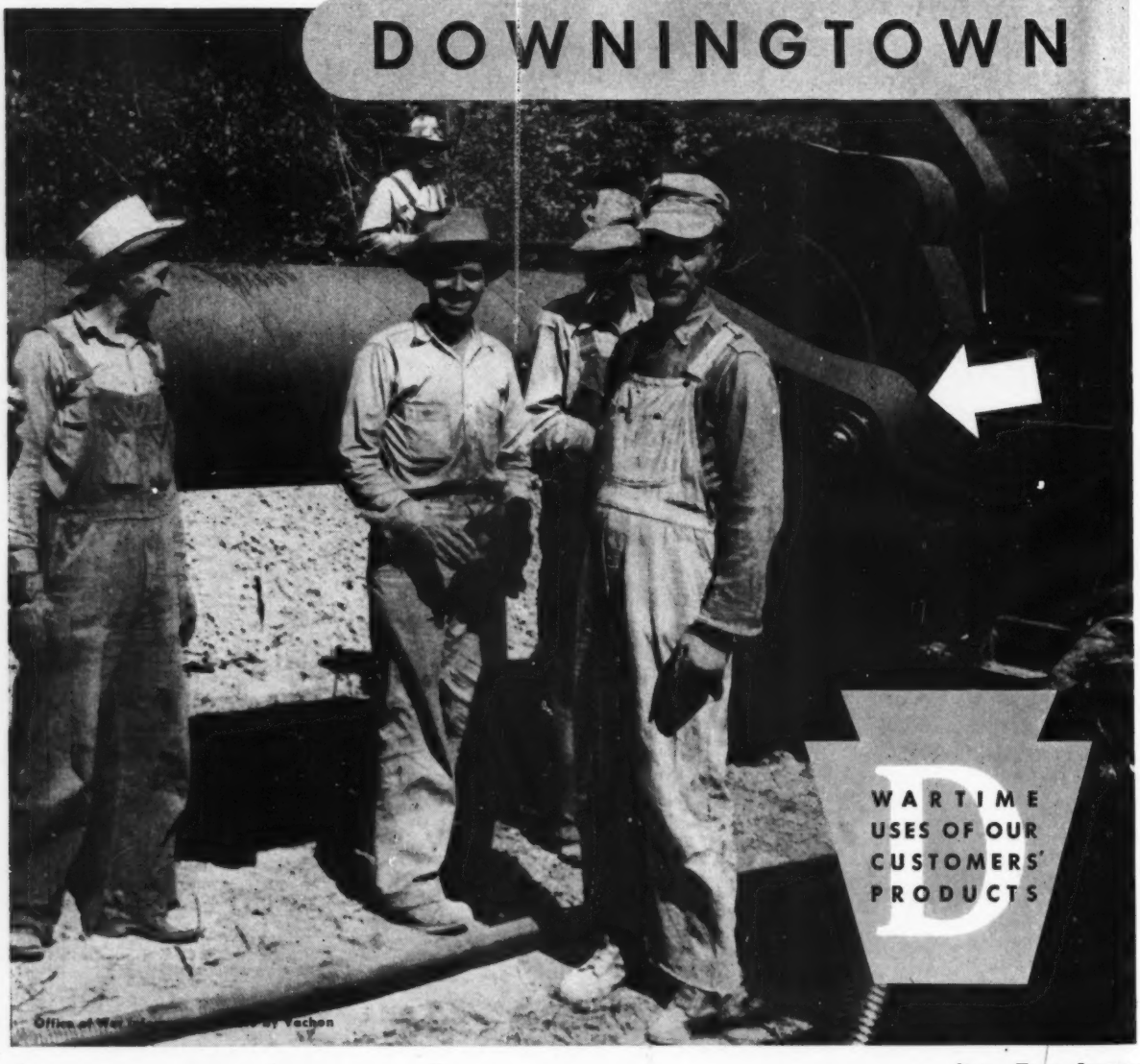
COTTON
IS PLENTIFUL
but
COTTON
YARN
IS Scarce
There are plenty of trees, yet there is a shortage of wood pulp. . . . There is plenty of oil, yet there is a shortage of gasoline. Likewise, there is plenty of cotton, yet there is a shortage of cotton yarn. Why? It's because vast quantities are used for tents, tarpaulins, camouflage, medical supplies and wearing apparel for service men and women, etc. . . . No matter what kind of a dryer felt you use, the longer you make it last, the more cotton yarn you make available for our armed forces.

ASTEN-HILL MFG. CO., PHILADELPHIA • ASTEN-HILL LTD., VALLEYFIELD, QUE.

"PAPER OVERCOAT" FOR "BIG INCH"

The "Big Inch" Oil Pipeline which runs 1475 miles from the wells in Texas to the refineries near New York and Philadelphia is wrapped with asbestos paper. This "Winter Overcoat" provides insulation that will help "keep oil flowing" when the weather gets bitter cold. Arrow in the photograph points to the roll of asbestos paper on the machine which rotates and spirals it around the pipeline. . . . We don't know who made the asbestos paper shown in this photograph, but we do know that with the aid of Downingtown Machinery, asbestos paper is made by our customers, Philip Carey Mfg. Co., Johns-Manville Corp., Keasbey & Mattison Co., Norristown Magnesia & Asbestos Co., Ruberoid Co., and U. S. Gypsum Co. . . . Performance of Downingtown Machinery under the stress of wartime conditions is something for every paper and board mill to remember, or investigate, before ordering post-war equipment. . . . Our Engineering Dept. is at your service, NOW. . . . Downingtown Mfg. Co., Downingtown, Pa.

DOWNINGTOWN



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Expert PREFABRICATION *-Pre-Engineered* SUSPENSION

Grinnell Prefabricated Piping assures faster assembly of piping and shortening of construction schedules that result from the "know-how" to interpret piping requirements and the modern facilities for expert prefabrication.

Equally essential is correct pipe suspension to compensate for movement and to relieve piping stresses. Grinnell solves this problem with pipe hangers *pre-engineered* for each installation. Grinnell Co., Inc. Executive Offices, Providence 1, R. I. Branch offices in principal cities.

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The only hanger offering all these important features for power piping support:

Constant-support of piping in all "hot" and "cold" positions. Full safety factor of the supported system is always maintained.

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Minimum headroom required.

GRINNELL PRE-ENGINEERED SPRING HANGERS

14 sizes with a load range from 84 lbs. to 4700 lbs.

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Compact — require minimum headroom.

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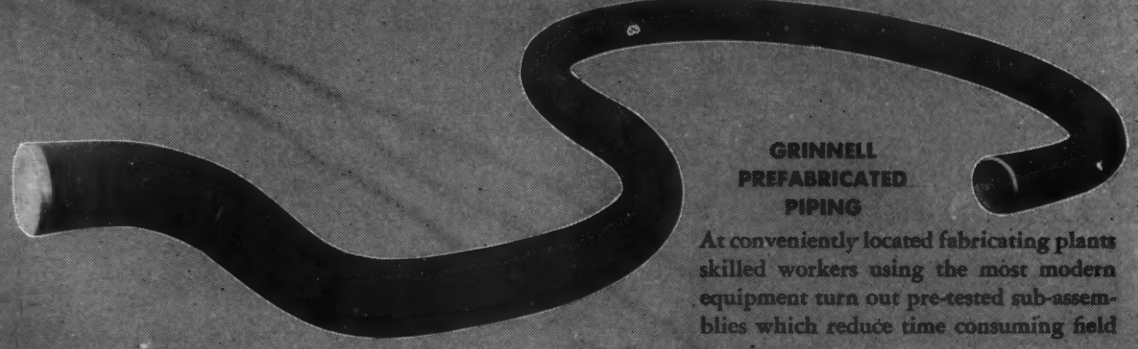
Easy selection of proper sizes from simple Capacity Table.



GRINNELL PREFABRICATED PIPING

At conveniently located fabricating plants skilled workers using the most modern equipment turn out pre-tested sub-assemblies which reduce time consuming field erection.

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☐ Prefabricated Piping ☐ Constant-Support Hangers
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PAPER TRADE JOURNAL
Title Reg. U. S. Pat. Off.

Vol. 118, No. 2 Thursday, January 13, 1944 Price Ten Cents

1942 Census of Paper and Paperboard Mills

Production Is Classified By Type, and That For the Year 1942 Is Compared With That For 1941 — The Paper and Paperboard Statistics Shown Are For 690 Mills In 1942 and 683 Mills In 1941.

The accompanying table shows statistics on production of paper and paperboard for 1942 and 1941. The data on paper and paperboard which were collected and compiled by the Industry Division of the Bureau of the Census, for the War Production Board and published in "Facts for Industry" Series 24-1-1, are similar in scope to those published for 1941.

The paper and paperboard production statistics are for 690 mills in 1942, and 683 mills in 1941; eight mills suspended operations in 1941 and 15 mills started operating in 1942. The count of mills and the total production for 1941 shown here differ from corresponding data given in the 1941 publication because of the inclusion in this report of 1941 and 1942 information for 23 mills not previously considered as producers of paper and paperboard. The additional mills are mainly producers of building paper and boards, the products of which were previously excluded because the equipment used in their manufacture was not usually regarded as paper-making machinery. However, since the physical characteristics of these products are similar to those usually classified as building paper and building boards, they are here included as an exception to the rule. Production data are not available for one mill falling in this general category. At the same time, certain other types of boards such as those made from gypsum and plaster are excluded, except for the paper liners used in their fabrication. Inquiries concerning these data should be sent to the Bureau of Census, Washington 25, D. C.

PRODUCTION OF PAPER AND PAPERBOARD, CLASSIFIED BY TYPE: 1942 AND 1941 (Tons of 2,000 pounds)

Type of paper and paperboard	1942	1941
All types	16,888,646	17,762,365
Newsprint, total	967,211	1,043,999
Standard, in rolls	932,183	989,335
Standard, in sheets	14,027	25,158
Groundwood printing and specialty paper (50% groundwood or more), total	610,168	642,676
Hanging	107,302	132,338
Catalogue and directory	80,578	69,594
Novel-news and news-tablet	29,818	36,820
Poster and railroad manila	25,582	46,632 [1]
Box lining and covering	13,257	
Printing	95,011	96,407
Rotogravure	123,581	136,510
Writing, mimeograph and tablet	45,639	
Bulking book and drawing	12,192	
Continuous form and sales-book	13,949	124,375
Coating and carbonizing	13,746	
Other groundwood papers	49,513	
Book papers (includes printing papers with less than 50% groundwood), total	1,704,029	2,025,891 [2] [3]
General printing, total	1,083,690	1,189,462
Plain and super (free from groundwood)	650,155	
Machine coated (free from groundwood)	103,862	
Plain and super (containing groundwood)	46,302	1,189,462
Machine coated (containing groundwood)	218,009	
Label, music, poster and wraps	39,192	
Bulking book	26,170	
Converting papers, total	480,916	463,168
Body stock for coated book (free from groundwood	200,871	360,793
Body stock for coated book (containing groundwood)	6,457	22,673 [3]
Envelope	103,091	
Tablet, adding machine and other business machine papers	135,303	259,702
Other converting papers	35,194	
Book papers—Continued		
Lithograph	26,215	68,220
Offset	106,146	118,568
Other book papers	7,062	6,473
Fine papers, total	1,055,475	950,014
Writing paper, total	769,743	738,434
Rag, total	123,242	109,165
Bonds and writings	72,472	
Ledgers	14,784	
Manifold	9,622	109,165 [4]
Papeterie and wedding	2,825	
Other rag	23,539	
Chemical, total	646,501	629,269
Bonds and writings	450,639	441,101
Manifold	28,599	
Mimeograph	78,024	
Papeterie	44,556	
Opaque circular	5,889	
Other chemical	38,794	188,168 [5]
Reproduction paper, total	61,740	
Blueprint and similar base stock	41,894	
Photographic and other sensitizing stock	19,846	
Cover paper	35,554	36,287
Text paper	10,494	25,284
Bristols, total	109,369	100,193
Index (chemical wood pulp and rag)	57,875	52,942
Postcard [6]	14,433	8,020
Printing (mill)	21,041	
Other bristols (except bogus)	16,020	39,231
Thin paper, total	59,095	49,816
Carbonizing	19,480	15,473
Condenser	4,749	4,184
Cigarette	30,564	19,478
Other thin paper (stencil, lens, etc.)	4,302	10,681
Other fine papers	9,480	[7]
Wrapping paper, total	2,525,841	2,605,307
Unbleached sulphite and semi-bleached sulphate, total	246,969	272,864
Butchers papers	145,828	145,970
Bag paper	17,463	18,631
Machine glazed wrapping	13,109	17,494
Envelope	12,204	
Grocers and imitation parchment	16,782	90,769
Other wrapping paper	41,583	

(Continued on page 18)

FINANCIAL NEWS

New York Stock Exchange

High, Low and Last for Week Ending January 8, 1944

STOCKS

	High	Low	Last
A. P. W.	2⅝	2⅜	2⅝
Armstrong Cork Co.	38⅞	38⅛	38⅞
Celotex Corp.	11⅜	11	11⅜
Celotex Corp., pf.	17¾	17	17¼
Certain-Teed Products Corp.	5⅜	4⅜	5⅛
Certain-Teed Products Corp., pf.	61½	59	59
Champion Paper & Fibre Co.	24¾	23	24¾
Champion Paper & Fibre Co., pf.	109	108	109
Congoleum Nairn Co.	23⅛	22½	23
Container Corp. of America	22	20½	21⅞
Continental-Diamond Fibre Co.	12¾	11⅜	11¾
Crown-Zellerbach Co.	17	16	16⅝
Crown-Zellerbach Co., pf.	98⅞	98½	98⅞
Dixie Cup Co.	15½	15¼	15½
Dixie Cup Co., pf.	44⅞	43¾	44⅞
Flintkote Co.	20⅜	19½	19⅝
Flintkote Co., pf.	106½	106	106
Robert Gair	3⅛	2⅞	3
Robert Gair, pf.	13½	12½	13¼
International Paper Co.	14¾	14	14
International Paper Co., pf.	68½	67⅞	68⅜
Johns-Manville Corp.	89½	86	87¾
Johns-Manville Corp., pf.	129¾	129¼	129¾
Kimberly-Clark Corp.	32½	32	32½
MacAndrews & Forbes	26¾	26½	26¾
MacAndrews & Forbes, pf.	....	....	....
Masonite Corp.	38½	38¼	38¼
Mead Corp.	8⅞	8	8⅞
Mead Corp., pf., A—6%	85¾	82	85¼
Mead Corp., pf., B—5½%	71	70	71
National Container Corp.	12½	12½	12½
Paraffine Companies, Inc.	46½	45	46½
Paraffine Companies, Inc., pf.	104	103½	103½
Rayonier, Inc.	13⅞	13¾	13¾
Rayonier, Inc., pf.	29⅞	29⅞	29⅞
Ruberoid Co.	26⅜	25	26¼
Scott Paper Co.	39¼	38¼	39
Scott Paper Co., pf.	112	112	112
Sutherland Paper Co.	31	30	31
Union Bag & Paper Corp.	9⅞	9⅝	9¾
United Paperboard Co.	4⅝	4⅜	4⅜
U. S. Gypsum Co.	75	73	74¾
U. S. Gypsum Co., pf.	....	....	....
West Virginia Pulp & Paper Co.	17½	16¾	17½
West Virginia Pulp & Paper Co., pf.	106	105¾	106

BONDS

Abitibi Pulp & Paper Co., 5s '53	71	70	70½
Celotex Corp. 3½s '55	101¾	101¾	101¾
Certain-Teed Products Corp. 5½s '48	101¼	100½	100½
Champion Paper & Fibre Co. 4¾s '50	....	....	....
International Paper Co. 6s '55	107	106¾	107
International Paper Co. 5s '47	104¼	104⅛	104⅛
Mead Corp. 3½s '53	....	....	....
West Virginia Pulp & Paper Co. 3s '54	102⅝	102⅜	102⅜

New York Curb Exchange

High, Low and Last for Week Ending January 8, 1944

STOCKS

	High	Low	Last
Great Northern Paper Co.	31	29¼	30⅜
Hummel-Ross Fibre Corp.	4½	4	4½
St. Regis Paper Co.	5	4⅝	4⅝
St. Regis Paper Co., pf.	147	147	147
Taggart Corp.	5⅛	5⅛	5⅛

BONDS

American Writing Paper Co. 6s '61	99⅜	99⅜	99⅝

Vote to Issue West Virginia Stock

Stockholders of the West Virginia Pulp and Paper Company have authorized an issue of $20,000,000 of preferred stock and an increase in the common stock from 1,000,000 to 1,500,000 shares. The company is expected to proceed immediately with an offer to exchange the present $15,583,000 of old preferred stock or the new preferred on a share for share basis.

The new stock, it is stated, may carry a dividend rate of 4½%.

Harriman Ripley & Co., Inc., will head a group to underwrite the new preferred issue. The exchange offer will expire on January 14, and if there is a public offering of any unsubscribed shares, it probably will be made on January 17.

Form Sea Foam Papermakers Inc.

[FROM OUR REGULAR CORRESPONDENT]

BROWNVILLE, N. Y., January 8, 1944—Announcement is made here that Attorney Theodore W. Charlebois has resigned as a director in the newly incorporated Brownville Paper Company besides turning over his stock and rights to Lieut. Henry A. Wise. Subsequent to his retirement from the case Lieut. Wise held a conference with Attorney Charles A. Phelps, counsel of the old Brownville Paper Company, and disclosed his purpose for forming the new Brownville Paper Company.

Because of the inability of the old company to arrive at a satisfactory understanding with Mr. Wise the Upham interests will incorporate at $100,000 under the new name Sea Foam Papermakers, Inc., and permit Lieut. Wise to keep his corporation. The plan for the Upham interests to re-incorporate is due to the fact that the original charter of the paper concern, incorporated in 1893, was for but fifty years duration and that term expired last March. For many years the Brownville Paper Company has manufactured Sea Foam Bond which has become well known to the trade. Therefore, Mr. Upham is making that the name of his new concern which will carry out all contracts and obligations of the old one. Directors besides himself will be Seymour M. Jones, James H. Lingenfelter and Robert L. Pease.

TAPPI Papermaking Committee Plans

A feature of the annual meeting of the Technical Association of the Pulp and Paper Industry will be a full day session by the TAPPI Papermaking Committee of which A. E. Bachmann, vice president of the Missisquoi Corporation is Chairman. The meeting will be held at the Commodore Hotel, New York, N. Y., on Tuesday, February 15.

The morning session will consist of a round table discussion covering a review and comparison of various pulp testing methods for freeness, physical and chemical characteristics, their significance and interpretation in terms of various paper properties and essential differences among pulps and prepared stocks in their ability to produce these papers at various drying rates.

The afternoon session will also be a round table discussion covering the comparison of principles of operation and stock characteristics and paper properties produced at various power consumptions from various types of stock preparation equipment, including beaters, jordans, refiners and other stock preparation equipment.

Will Keep Baby's Blue Sock for Luck

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., January 10, 1944—George L. Hoagland, 26, yeoman 2-c, of Quincy, Mass., employed by John Carter & Co., Inc., when called to active duty in the Navy in the spring of 1941, was one of the men rescued from the U. S. destroyer which exploded and sank in lower New York bay January 3. He enlisted in the Naval Reserve in 1940. He was married December 22, 1940, to Miss Bertha V. Rydwell, of Quincy. Their baby, George, Jr., was born September 7, 1943. When picked up, he was clutching his baby's blue sock for luck. "I'm going to hang on to that now, for sure," he said.

How to Get Better Process Water

. . . Have NORWOOD FILTERS And Always Keep Them In Good Operating Condition

A typical installation of Norwood Filters. Notice scum on water before filtration.

YOU can get better process water . . . to help you make a better sheet . . . if you have Norwood Filters and give them the little bit of attention they need to keep them always in good operating condition.

Norwood gravity and pressure filters are built on the basis of 50 years of working with paper mill process water problems. They have many sound features of design and construction which assure you of years of trouble-free performance.

Hundreds of Norwood Filters are in operation . . . 24 hours a day . . . in leading paper mills throughout the United States and Canada. They are doing a good job . . . filtering out dirt and foreign matter . . . and giving a clean, sparkling water that helps make a better sheet.

Check up on your filters now. Have the necessary repairs and replacements made . . . to keep them operating at top efficiency. We'll be glad to work with you.

Make use of Norwood's engineering staff. Write us about your process water problems, or ask for Filter Data Units.

Get a Good Start And a Good Finish With
NORWOOD
WATER FILTERS AND PAPER FINISHING MACHINERY

The Norwood Engineering Company
17 No. Maple St., Florence, Mass.

Government Makes Awards for Paper

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., January 12, 1944—Paper Corp. of the U. S. has been awarded the contract for furnishing the Government Printing Office with 130,240 pounds of tan bristol cover paper at 9.94 cents. Other paper awards recently announced include the following:

R. P. Andrews Paper Company will furnish 150,000 pounds of white sulphite index paper at $11,400.00 and the Central Ohio Paper Company will furnish 150,000 pounds of canary smooth finish Copco duplicator paper at 8 cents. Ditto, Inc., will furnish 500,000 pounds of canary duplicator paper at 8.75 cents and D. L. Ward Company will furnish 55,150 pounds of white bristol paper at 8.68 cents. Whitaker Paper Company will furnish 300,000 pounds of same at 7.75 cents and Walker Goulard Plehn Company will furnish 81,500 pounds of yellow writing paper at 8.68 cents. D. L. Ward Paper Company will also furnish 48,000 pounds of white duplicator paper at 8.1 cents.

Eastern Corporation will furnish 51,606 pounds of goldenrod duplicating paper at $9.36 per cwt. and Bulkley, Dunton Company will furnish 2,870 pounds of same pink at $9.85 per cwt. Barton, Duer & Koch Paper Company will furnish 100,000 pounds of white M. C. paper at 6.37 cents, and the Cawthorne Paper Company will furnish 100,000 pounds of yellow chmeical wood writing paper at 8.35 cents.

The Marquette Paper Corporation will furnish 39,000 pounds of white M. F. book paper at 7.42 cents and the Cauthorne Paper Company will furnish 39,900 pounds of chemical wood yellow paper at 8.25 cents. Collins Manufacturing Company will furnish 28,405 pounds of Riegel Tuftwite tag at 8.6 cents. The same firm will furnish 3,510 pounds of same at 10.1 cents.

Franklin Research Company will also furnish 160,000 pounds of white nautical chart paper at $29,692.50 and Crocker, Burbank Papers, Inc., will furnish 238,065 pounds of aeronautic chart paper at $117,842.17. The same firm will also furnish 55,500 pounds of same at $27,472.50. Stanford Paper Company will furnish 294,000 pounds of chemical white wood writing paper at $19,845.00.

Franklin Research Company will furnish the following quantities of 50% rag white nautical chart paper: 9,090 pounds at $1,681.65; 8,620 pounds at $1,594.60; 40,000 pounds at $7,400.00; 134,750 pounds at $24,928.75; 104,000 pounds at $19,240.00. Whitaker Paper Company will furnish 375,000 pounds of 25% rag bond paper at $53,400.00 and Byron Weston Company will furnish 132,900 pounds of aeronautical chart paper at $63,792.00. Crocker, Burbank Company will also furnish 132,900 pounds of same at $63,792.00.

R. P. Andrews Paper Company will furnish 555,000 pounds of chemical wood map paper at 15.9 cents and Mead Sales Company will furnish 80,000 pounds of poster paper at 7.32 cents. R. P. Andrews Paper Company will furnish 100,000 pounds of same at 7.3 cents.

There is a Lot of "KNOW-HOW" Built into These Pumps

The new Ingersoll-Rand vertical stock pump is built to meet the exacting requirements of the paper industry.

The pump is simple and all parts are accessible. It can be completely dismantled without disturbing the discharge piping.

Flow of stock to the pump is downward and directly into the impeller. A heavy renewable shroud permits the restoration of the original pump efficiency after prolonged service.

These features and the fact that the pump requires little floor space mean real savings.

Ask our engineers for complete details. Ingersoll-Rand Company, 11 Broadway, New York 4, N. Y.

Ingersoll-Rand

Cameron Pump Division

10-359

Oppose WPB "Stockpile"

The Publishers Association of New York City voted on January 8 to oppose the plan of the War Production Board to stockpile 18,000 tons of Canadian newsprint monthly. A resolution will be sent to WPB following its adoption by the association embodying principal points of objection to the plan which was announced by the WPB on December 21.

The action of the New York group was similar to that of the Chicago Newspaper Publishers Association, which voted unanimously in favor of the abandonment of the stockpile plan.

Under the WPB plan newsprint in excess of 182,000 tons a month delivered here from Canada will be bought by the United States Government as a reserve against possible shortages in the last half of the year.

The first quarter allotments of newsprint here will not be affected by the plan, it was said, but the reserve shipments will be held by the Government until the newsprint crisis passes.

The WPB plan was announced after the Canadian Government informed the agency that production of newsprint amounting to at least 200,000 tons monthly could be shipped to the United States. A 23.6 per cent curtailment order went into effect January 1 on the basis of 182,000 tons monthly from Canada.

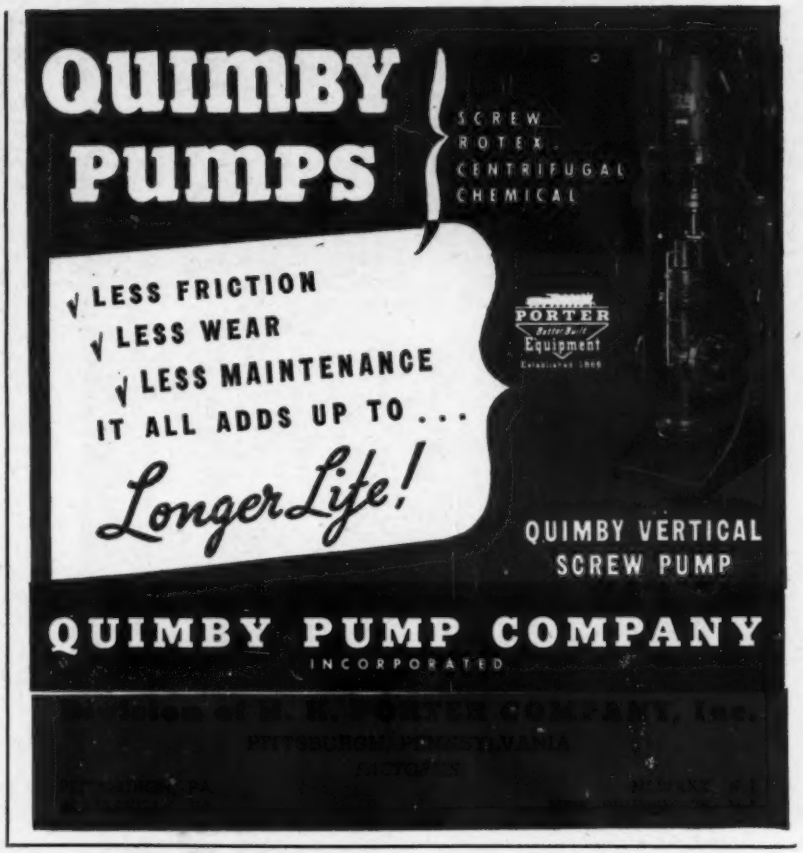
Buys United Color Div.

Calco Chemical Division, American Cyanamid Company announced today the purchase from Interchemical Corporation of its United Color and Pigment Company Division located in Newark, N. J. United, with manufacturing facilities covering 8 acres and employing some 500 people has been a major factor in the production of organic and inorganic chemical colors. In peace time their products go to all types of color-consuming industries and since the outbreak of war they have also been supplying heavy demands for pigments to be used in camouflage and protective coatings for military purposes.

The Calco Chemical Division manufactures organic intermediates and dyes many of which are raw materials for the production of organic chemical colors. The combined production as well as research and technical service facilities is expected to make possible greater contributions to the pigment consuming industries.

According to the Calco statement the new unit will be known as United Color and Pigment Department, Calco Chemical Division, with "no change of management, personnel or policies contemplated."

Purchase price paid for United Color and Pigment Company Division was not listed.



Pulp Supply Held Critical

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., January 10, 1944 —Such large quantities of paper are going overseas in the form of cartons for the packaging of materials and supplies and not returning as salvage, that the unusual drain on new pulp makes it apparent that every ounce possible must be saved.

Pulp for high tensil strength rayon for tires represents a huge program in itself and takes a very large supply of raw materials. Current conservation programs and salvage collection are getting more attention, but the fact remains that with every bit of salvage possible rounded up, an acute shortage of supply will still remain. Pulpwood cutting is said to be now progressing favorably, with more men in the woods than last year, but the demand for pulp and papers of all kinds is so insistent that there is little opportunity for mills to replenish their dwindling stockpiles.

Government officials insist that it is their policy to keep essential publications as well supplied as possible with paper, realizing the importance of these papers in the dissemination of necessary information.

There was some surprise at the high estimate of Canadian newsprint which the Wartime Prices and Trade Board officials have undertaken to make available to U. S. publishers during the first six months of 1944. It is explained that this is due partly to improved woods operations and in part to extension of wood fibre supplies by clay filler and other measures designed to save wood content.

These alternate sources of supply are expected to produce an additional 4% or between 8,000 and 10,000 tons of newsprint per month to supplement the wood supply. It is stated that the actual equivalent of wood consumption under the new United States quota of 200,000 tons a month will be only 192,000 tons, the other 8,000 tons monthly is expected to be made up largely from the use of clay filler and a consequent reduction in pulp content and the use of waste paper.

1942 CENSUS OF PAPER AND PAPERBOARD MILLS

(Continued from page 7)

Type of paper and paperboard	1942	1941
Bleached sulphite and bleached sulphate, total	331,613	383,556
Waxing stock (18 lbs. and up, M. F. and M. G.)	155,741	173,607
Bag paper	31,062	43,608
Machine glazed wrapping	26,143	29,480
Other wrapping paper	118,667	136,861
Unbleached sulphate (kraft), total	1,656,198	1,671,159
Wrapping (M. F.)	432,377	428,110
Wrapping (M. G.)	36,557	46,689
Grocer bag and sack paper (M. F.)	543,081	582,971
Grocer bag and sack paper (M. G.)	22,633	24,275
Heavy duty and multi-wall sack paper	250,591	269,970
Other bag (M. F.)	35,647	38,266
Other bag (M. G.)	11,248	12,045
Converting papers, total	324,064	269,833
Asphalting and creping (other than towel)	96,381	
Envelope	49,711	
Gumming	57,969	269,833 [8]
Twisting and spinning (over 18 lbs.)	18,693	
Other converting papers	82,123	
Waxing (over 18 lbs. M. F.)	15,103 [9]	[10]
Waxing (over 18 lbs. M. G.)	4,084 [9]	[10]
Other kraft, including imitation kraft	10,039	[11]
Manila wrapping (envelope)	32,507	34,616
Greaseproof	22,799	25,888
Glassine and related grades	81,392	70,437
Vegetable parchment	30,806	42,412
Bogus, screenings and core papers	27,846	36,899
Mill wrappers	59,642	56,816
Other wrapping paper	26,030	10,660
Special industrial papers (500 sheets, 100 lbs. and up), total	187,897	173,134
Rope and jute paper	20,149	22,218
Tagboard, light manila board, file folder, and pattern (100% chemical pulp)	129,079	150,916
Tagboard, light manila board, file folder, pattern (with groundwood)	33,265	
Other special industrial papers	5,404	[11]
Sanitary papers, total	811,343	737,538
Sanitary napkin stock, wadding stock	37,610	38,577
Toweling stock	191,373	194,840
Toilet tissue stock	414,655	332,969
Napkin stock	77,607	85,676
Facial tissue stock	89,194	85,476
Other sanitary papers	904	[12]
Tissue paper, other than sanitary and thin papers (480 sheets, under 18 lbs.), total	170,653	175,336
Waxing tissue	46,979	40,353
Wrapping tissue	53,321	68,021
Pattern tissue	3,660	3,529
Twisting stock	9,481	13,682
Fruit and vegetable wrapping tissue	40,846	39,281
Other tissue paper	16,366	10,470
Absorbent paper, total	64,530	61,941
Blotting	9,496	14,683
Filter	4,196	3,906
Matrix paper and board	6,371	6,255
Vulcanized fiber stock	29,442	26,161
Vulcanized fiber stock	29,442	26,161
Resin impregnating stock	8,540	[13]
Other absorbent paper	6,485	10,936
Building papers, total	1,001,383	917,912
Sheathing paper	42,783	45,788
Felts	841,995	766,911
Asbestos and asbestos-filled	95,025	98,538
Other building papers	21,580	6,675
Paper not elsewhere classified	16,148	28,657
Boards, total	7,773,968	8,399,960
Container board, total	3,755,436	4,183,846
Kraft liner (over .009)	1,455,100	
Jute liner (over .009)	814,385	
Corrugating board (.009)	969,215	
Straw	361,041	
Kraft	341,699	
Bogus	86,969	4,183,846
Other corrugating	179,506	
Container chip (.009)	81,201	
Container chip (over .009)	345,743	
Other container board	89,794	
Tube stock	164,785	[14]
Folding boxboard	1,711,795	1,841,916
Manila and bleached manila lined chipboard (single and double lined)	600,751	
Patent coated (all type backs)	344,477	
Solid sulphate (bleached and unbleached)	66,196	
Solid sulphite (bleached and unbleached)	32,875	1,841,916
Sulphate and sulphite lined solid manila	71,891	
Bending chip	211,078	
Kraft lined (single and double)	60,584	
Suit boxboard (all colors)	99,325	
Other folding boxboard	168,052	
Clay coated (bending)	56,566	[15]
Set-up boxboard (nonbending and unpasted), total	966,688	1,238,850 [16]
Chipboard	487,261	523,792
Strawboard (over .009)	21,156	
Solid newsboard	137,273	406,436
News-lined chipboard	274,296	
White wool vat lined	36,171	[16]
Other set-up boxboard	40,531	308,622 [16]
Cardboard, total	53,963	80,060 [17]
Clay coated blanks, etc.	17,885	44,847 [17]
Blanks (uncoated)	10,294	
Bogus bristol	7,002	35,213
Other cardboard [18]	18,782	
Bindersboard (wet machine)	35,248	46,667
Leatherboard	18,306	21,367
Pressboard (includes imitation pressboard)	23,565	19,816
Building boards	856,838	761,480
Wallboards	260,057	254,477
Insulating [19]	413,489	362,033
Liner for gypsum or plaster board	175,476	132,917
Other building	7,816	12,053
Matchboard (splint stock)	25,916	23,841
Dense fiber (counter, heels, gaskets, etc.)	32,103	29,768
Solid wood pulp and solid manila board	27,574	[20]
Boards not elsewhere classified [21]	71,749	152,349 [22]

[1] Approximately comparable with 1942 figures for Poster and Railroad Manila, and Box Lining and Covering, although a small amount of Railroad Manila was reported in Other Groundwood Papers in 1941.

[2] The several Book Paper classifications include small quantities of Blue Print and similar base stock, and Photographic and Other Sensitizing Stock, classified as Fine Paper and shown separately for 1942. Also see footnote 3.

[3] Includes Cup Stock, reported in Waxing Papers under Unbleached Sulphate Converting Papers in 1942.

[4] Shown under following headings in 1941 report: 100 per cent Rag, 50 per cent-100 per cent Rag, and less than 50 per cent Rag.

[5] Comparable with the bracketed items for 1942, except that small quantities of Reproduction Paper were reported as Book Paper and Paper Not Elsewhere Classified in 1941. See footnote 2 above.

[6] Includes Government Postal Card stock.

[7] Not separable from other types of Fine Paper in 1941.

[8] Included with Other Kraft Converting Papers (M. F. and M. G.) in 1941 report.

[9] Includes Cup Stock, reported as part of Body Stock for Coated Book (Containing Groundwood) under Converting Papers in the Book Paper classification in 1941.

[10] Included with Body Stock for Coated Book (Containing Groundwood) under Converting Papers in the Book Paper classification in 1941.

[11] Included in Kraft Converting Papers and Other Wrapping Paper.

[12] Included in Other Tissue Paper.

[13] Classification in 1941 indeterminable.

[14] Included in Other Set-up Boxboard.

[15] Reported as Cardboard Clay-Coated Blanks and Other Folding Boards in 1941.

[16] Includes Tube Stock and White Wood Vat Lined shown separately in 1942.

[17] Includes Clay-Coated Folding Boxboard shown separately in 1942.

[18] Includes Clay-Coated Tag and Photomounts, here combined with Other Cardboard to avoid disclosing operations of individual establishments.

[19] Represents 70-75 per cent of total Insulating Board production.

[20] Included in Boards Not Elsewhere Classified.

[21] Includes Panel Board, here combined with Boards Not Elsewhere Classified, to avoid disclosing operations of individual establishments.

[22] Includes an indeterminate quantity of unspecified types of board which was allocated to specific types in 1942.

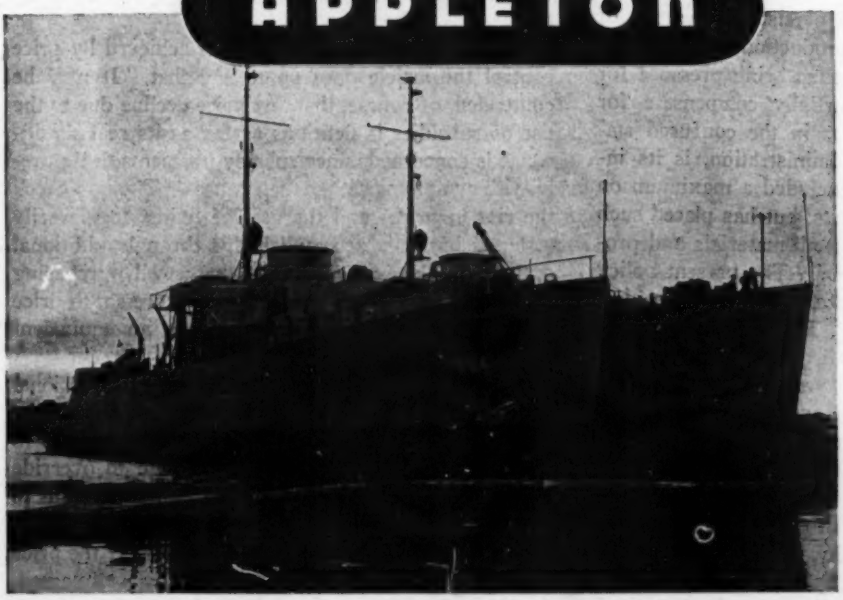
ATTENTION PAPER MILLS

Old established Paper Merchants contemplate entering Specialty Converting field. Would locate adjacent Paper Mill making varied line of papers suitable this purpose. Open to suggestions from Mills looking ahead to post-war business for their products. Replies treated in confidence. Box 44-14 care Paper Trade Journal.

J-13

The annual Christmas party of the Bulkley, Dunton organization was held at the Duane Hotel, Madison avenue, New York. More than 150 people attended this gay affair and the photographer had quite a time in focusing his camera to get them all in without too much distortion. Many friends will recognize at the lefthand side table in the foreground Joe Bulkley and Wendell Cowles, heads of the Paper Company, George Cobean, head of the export company (sitting next to Arthur Schroeder, president of the Pejepscot Paper Company), and Fred Enders, head of the pulp company. The dinner was followed by dancing and the gay and successful party lasted well into the small hours.

APPLETON



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PAPER TRADE JOURNAL

Title Reg. U. S. Pat. Off.

Henry J. Berger

EDITOR

Vol. 118 January 13, 1944 No. 2

COMING EVENTS IN PAPER INDUSTRY

American Paper and Pulp Association, Sixty-seventh Annual Convention and meeting, Waldorf-Astoria Hotel, New York, February 14-18.

Technical Association of the Pulp and Paper Industry, Convention, Commodore Hotel, New York, February 14-17.

National Paper Trade Association of the United States, Convention, Waldorf-Astoria Hotel, New York, February 14-17.

The New York Association Of Dealers In Paper Mills' Supplies, Annual Banquet, Commodore Hotel, New York, Tuesday, February 15.

New England Section. Technical Association of the Pulp and Paper Industry—Third Friday of each month at the Roger Smith Hotel, Holyoke, Mass.

Delaware Valley Section. Technical Association of the Pulp and Paper Industry—First Friday of each month at the Engineers Club, Philadelphia, Pa.

Lake States Section. Technical Association of the Pulp and Paper Industry—Second Tuesday of each month at the Conway Hotel, Appleton, Wis.

Kalamazoo Valley Section. Technical Association of the Pulp and Paper Industry—First Thursday of each month at the Park, American Hotel, Kalamazoo, Mich.

PRICE STABILIZATION

Price stabilization and the attempt to establish by arbitrary means a level of prices which it is hoped may prevent an undue rise in the general cost of living, is an extremely difficult and ambitious undertaking, for it must be complete enough to eliminate the normal operation of the law of supply and demand to be successful. The chief obstacle to the attainment of a completely successful stabilization program lies, of course, in the persistent pressure of wages, which create higher production costs and inflationary dangers and so in turn bring pressure for higher prices to at least partially compensate for greater costs. Another factor in the confused stabilization program of the Administration, is its inconsistent policy which has excluded a maximum on wages and agricultural products, but has placed such arbitrary economic controls on all materials and processed goods and most services. The present policy of the government is a mixture of political considerations with economic factors. By providing various exceptions in the form of privileges of wage increases to some groups, while other groups are less favored, the results thus far achieved are about as good as could be expected, though admittedly falling far short of what the Administration and most business men desire.

In discussing the difficulties to effect a reasoonably efficient degree of price stability, the last issue of *The Guaranty Survey*, published by the Guaranty Trust Company, of New York, states in part: "Estimates of the amount of this so-called "inflationary gap" (excess income which can not be absorbed by the limited quantity of goods available today) have appeared at such frequent intervals, have varied so widely and have been calculated on so many different bases that the figures probably have little meaning to most readers. It may be doubted whether the problem is statistically measurable except in broadest outline. It is beyond question, however, that the trends of individual incomes on the one hand and of the production of consumers' goods on the other have moved in opposite directions and have created a wide disparity between purchasing power and supply. This gap, which constitutes the greatest threat to stability of the price level, has been only partly closed by such offsetting influences as higher taxes, purchases of war bonds, and debt repayments. The degree of price stability that has been maintained in the face of such obstacles compares very favorably with the advance that took place during the last war."

Analyzing the trends under general price regulation, the article continues: "The inauguration of general price control was followed by a period of much greater stability. The limitations placed on the power of control officials, however, were distinctly felt. Farm prices, which were almost completely free from direct control, continued to advance, at the rate of nearly one per cent a month, and factory wages, which also were exempt from regulation, rose even more rapidly than before. The President's stabilization order of October, 1942, which was aimed primarily at wage rates, was partly successful in that direction but had no marked effect on prices. The general level, in fact, rose more rapidly during the six months that preceded it; and farm prices advanced more than 2% monthly, nearly three times as fast as during the initial period of general price control."

Pointing out some of the results achieved by price control the article goes on to say that, "It may be contended, of course, that any price decline due to the use of subsidies is fictitious as far as its real significance is concerned, since subsidy payments deal purely with symptoms rather than causes. They do check the rise in prices and the cost of living, temporarily at least; but they accomplish this through additional outlays of Government funds that swell purchasing power and may be as disturbing, or more so, to price movements in the final analysis than an equivalent rise in current market quotations."

In conclusion the article states: "Congressional sentiment is clearly against the use of subsidies as a wartime stabilization device, but only time can reveal whether this sentiment is strong enough to override the apparent determination of the Administration to continue the use of the subsidy method. Even if subsidies are given up, however, and even if the price stability of recent months is not fully maintained, there is still reason to hope that general price control, reinforced by high tax rates and the large flow of savings into Government bond purchases, will hold the price advance within much narrower limits than

it was held during the last war. And any sacrifice of price stability that might result from the abandonment of subsidies would perhaps be more than compensated for by the avoidance of the dangers and known evils that lie in the use of this device."

Pay Rise for Canadian Pulp Workers

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., January 10, 1944—The Regional War Labor Board for Quebec Province has announced that workers in the pulp and paper industry of the Province have been granted a 5-cent an hour increase in wages.

The announcement followed a series of talks among representative of the International Brotherhood of Pulp, Paper and Sulphite Workers, the paper, pulp and sulphite industries and the Board. Wages in those industries averaged from 45 to 47 cents an hour and the workers were asking for wages equal to those paid in Ontario.

It was also announced that the Board was studying differences in wage scales in pulp, paper and sulphite industries of both provinces and that the cost of operations in Quebec and Ontario will be taken into consideration before drafting a new wage scale.

The five-cent an hour increase will stand until a definite plan is announced.

Warren D. Thompson Resigns

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., January 10, 1944—Warren D. Thompson, salesman for Baird & Bartlett Company, paper board house, for 18 years, covering a part of Boston, Providence, and Connecticut, resigned as of January 1 to go to his camps, Rust Pond Cabins, Wolfeboro, N. H., where he will be indefinitely, operating the camps.

Production Ratio Report*

(Production as percent of six-day capacity)

COMPARATIVE WEEKLY SUMMARIES

Current Weeks—1943		Corresponding Weeks—1942	
November 27	89.8	November 28	82.3
December 4	91.7	December 5	84.9
December 11	89.6	December 12	88.4
December 18	89.1	December 19	87.9
December 25	70.0	December 26	63.3
January 1	72.1	January 2	75.9

COMPARATIVE MONTHLY SUMMARIES

Year	Jan.	Feb.	Mar.	Apr.	May	June	July
1942	104.5	103.9	102.9	100.4	95.3	87.4	75.8
1943	87.2	88.9	89.5	88.7	91.4	86.4	84.4

Year	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1942	80.8	82.8	90.6	86.9	80.1	90.4
1943	91.1	88.3	90.2	90.6	82.8	87.8

COMPARATIVE YEARLY SUMMARIES

	1936	1937	1938	1939	1940	1941	1942	1943
Year to Date	80.4	80.8	71.5	83.4	85.6	97.4	90.4	88.2
Year Average	80.4	79.8	71.5	83.4	85.6	97.4	90.4	...

* Based on tonnage reported to American Paper and Pulp Association. Does not include mills reporting to National Paperboard Association, except in isolated cases where both paper and paperboard are produced and separate tonnage figures are not readily available. Does not include mills producing newsprint exclusively.

PAPERBOARD OPERATING RATIOS †

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1937	83	89	89	91	88	80	69	77	72	70	57	47	75
1938	56	63	63	60	60	59	59	60	70	73	67	61	64
1939	65	73	76	74	69	73	68	77	82	91	88	77	77
1940	78	75	74	76	82	85	77	79	78	85	82	77	78
1941	81	88	89	89	91	94	92	98	95	99	98	90	92
1942	102	101	101	95	82	72	68	75	76	81	82	77	84
1943	86	88	94	94	96	94	89	96	94	94	93	87	93

Week ending Nov. 27, 1943—91 — Week ending Dec. 18, 1943—96
Week ending Dec. 4, 1943—95 — Week ending Dec. 25, 1943—87
Week ending Dec. 11, 1943—96 — Week ending Jan. 1, 1944—63

† Per cents of operation based on "Inch-Hours" reported to the National Paperboard Assn.

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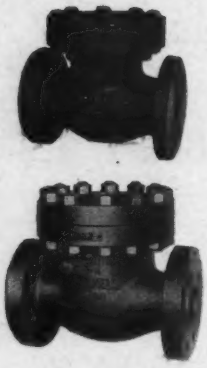

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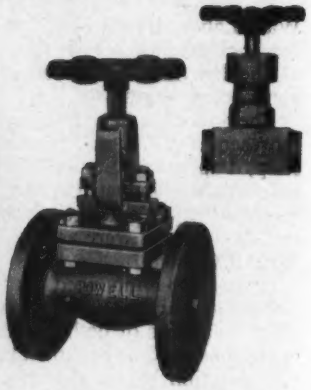

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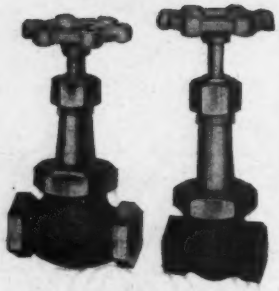

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122 E. 42nd St., New York 17, N. Y.
Edited by R. G. Macdonald, Secretary

Instrumentation Studies XLIX*

Penetration of Papers by Water Vapor. III.

Techniques for Measuring Water-Vapor Transfer

By the Staff of The Institute of Paper Chemistry

Abstract

A variation of the cup method for measuring the water vapor permeability of creased and uncreased sheet materials is described. The specimens are maintained at 100° F. with one side exposed to a relative humidity of 92% and the other side to a relative humidity of 23%. The application of an electric hygrometer to the control of relative humidity in a testing room or cabinet is described and a vacuum tube amplifier control circuit which may be used with the hygrometer is presented.

TAPPI Standard T 448 m-41 for water vapor permeability of paper and paperboard was the outgrowth of many years of careful study of that property and of experience in the testing of papers for the peace-time wrapping and packaging of food and other materials (*1-13*) Method A of that Standard, in which a desiccant is used in the cup, with a relative humidity of 50% outside the cup, is intended for measuring the water vapor permeabilities of materials used for protecting dry products against the absorption of water vapor from the surrounding atmosphere under average humidity conditions. Method B, in which water is used in the cup, with a relative humidity of 50% outside the cup, is intended for evaluating the permeabilities of materials used for protecting moist products against loss of moisture to the surrounding atmosphere under average humidity conditions. The standard temperature of 73° F. is used in both variations of the TAPPI procedure. Two methods are specified in recognition of the fact that, for many materials, the water vapor permeability is not a true constant which can be uniquely defined by application of Fick's diffusion equation—i.e., the rate of water vapor transfer through these materials is not proportional to the partial vapor pressure difference across the specimen when wide variations in vapor pressure difference are effected (*2, 3, 10, 13*). Hence, the water vapor permeability determined for a particular set of conditions cannot, in general, be safely used to predict the rate at which water vapor will pass through the sample under widely different conditions.

When the exigencies of war introduced the necessity of using substitutive wrapping and packaging materials, the industries involved were not well prepared to define the limiting conditions under which the substituted packaging materials would satisfactorily protect the contents of the package. This situation was due to a lack of adequate experience in the application of the packaging materials under the required extremes of temperature and relative humidity and, consequently, to the absence of accepted testing procedures for these extreme conditions.

The conditions under which a package must survive are severe. They include such extremes as tropical conditions of high temperature and high relative humidity, desert conditions of high temperature and low relative humidity, and arctic conditions of low temperature and high relative humidity. Although there appears to be little, if any, available information on the water vapor permeability of packaging materials under arctic conditions, it seems to be generally assumed that tropical conditions are the most difficult for a package to survive and the trend in testing techniques has been toward the use of high temperatures and high relative humidities.

The urgency of the problem has stimulated the rapid development of testing procedures more severe than those of the TAPPI Standard. The development has been governed by expediency to a considerable extent. One of the tests used in a number of laboratories is the GFMVT test (*14*). This report describes another method for determining the water vapor permeability of flat specimens; this method is particularly applicable when the volume of testing is large. The first section presents a working outline of the procedure; comments on the individual steps and features of the procedure are reserved for the second section. The third section contains suggestions for adapting the permeability testing procedure to operation in a conditioned cabinet instead of in a conditioned room, and the last section briefly describes the use of an electric hygrometer (*16*) for controlling the relative humidity of a testing room or cabinet.

* This report is one of a series issued as a part of the Instrumentation Program of the American Paper and Pulp Association.
Part II of this series appeared in Paper Trade J. 116, no. 24:16-18; 117, no. 1:12-15 (June 17, July 1, 1943).
A part of this material was presented at the Army and Navy Requirements Conference of the Technical Association of the Pulp and Paper Industry, Palmer House, Chicago, Ill., Sept. 21-24, 1943.

I. Procedure for Determining the Water Vapor Permeability of Sheet Matrials

This method is a variation of the commonly used cup method. The specimens are prepared, and the testing done in a room conditioned at 100° F. and 23% relative humidity. The cup over which the specimen is sealed contains a saturated salt solution which yields an equilibrium relative humidity of 92%. The cup is weighed periodically and its loss in weight plotted as a function of the elapsed time of test. The water-vapor permeability of the specimen is calculated from the slope of the linear portion of the resulting curve.

Before presenting the steps of the procedure in detail, it will be helpful to list the equipment and supplies which are used.

Equipment and Supplies

1. The *testing room* is conditioned at 100° F. and 23% relative humidity. More details will be given in Sections II and IV.

2. Pyrex *crystallizing dishes*, 90 by 50 mm., form convenient cups. Although not as light as aluminum cups, they are easily available and do not react with the salt solutions used in the test.

3. *Waxed-paper boxes* are used to hold the saturated salt solution while the specimen is sealed to the cup. These are made by folding and heat sealing a square of waxed paper into an open-top box 2 by 2 by 5/8 inches and then attaching another square of waxed paper as a cover. A hole having an area of about 0.5 sq. in. is cut near the middle of this cover. A piece of blotter stock is folded over the outside of the bottom and sides of the box and held with short strips of Scotch tape. The blotter later acts as a wick and carries the saturated salt solution over the inverted box. These boxes are illustrated schematically in Fig. 1.

4. A *saturated solution of ammonium dihydrogen phosphate* ($NH_4H_2PO_4$) is used to produce a relative humidity of 92% in the cup. A stock botle of this solution, with an excess of salt, is stored in the testing room.

5. A *metal template* is used in sealing the specimen to the cup. This template is a plate of steel or other metal, 5 inches square and 3/8 inch thick. As shown schematically in Fig. 2, a circular area 3.5 inches in diameter is machined to a level 5/64 inch below the surface of the plate. This flat area is circumscribed by an annular groove or moat with beveled sides. The bottom of this groove is 4/32 inch below the level of the central area, and the top of the groove is 7/32 inch wide.

6. *Petrolatum* is used to lubricate the template so that it may be easily separated from the wax bead around the top of the cup after the specimen has been sealed in place.

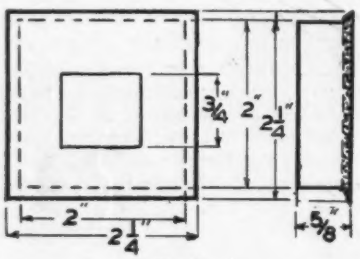

Fig. 1
Waxed-Paper Box which holds the Saturated Salt Solution during the Sealing Operation

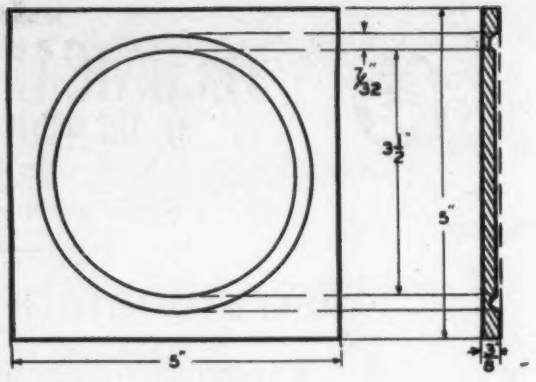

Fig. 2
Template used in Sealing the Specimen to the Crystallizing Dish

7. The *wax* mixture used in sealing the specimen to the cup is made by mixing equal quantities of crude beeswax and gum rosin.

8. A *hot plate* may be used for melting the wax employed in sealing the specimen.

9. A 25-ml. *pipe* is convenient for applying the wax during the sealing operation. The tubes above and below the bulb are about 2 inches in length, and a rubber bulb it attached to the top tube to provide suction for drawing the molten wax into the pipe and pressure for expelling the wax.

10. A *sheet-metal disk*, 3 11/16 inches in diameter, is used as a template for laying out the specimen disks.

11. A *weight* of about 500 grams is used to hold the cup firmly on the specimen during the sealing operation.

12. An *analytical balance* sensitive to at least 0.001 gram is required for weighing the cups.

13. *Stacks of shelves* form a convenient means of storing the cups during the test period. The shelves are about 3 inches wide and are spaced vertically at about 4-inch intervals. The racks may be placed on a table or mounted on the wall. In either case, the lengthwise direction of the shelves should be perpendicular to the wall, so that there is adequate air circulation over the specimens.

Preparation of Specimens

Specimens are tested in the usual flat, uncreased form and also after creasing by a technique which is described in another paper (*17*). The number of uncreased specimens tested depends on the character of the sample. If the sample is submitted without a statement as to the manner in which it is to be used and if there is no obvious reason for exposing only one side to the high relative humidity, a total of 13 specimens are cut; four are creased and tested with one side at 92% relative humidity, four uncreased specimens are tested with one side exposed to the high relative humidity, four uncreased specimens are tested with the opposite side exposed to the high relative humidity, and one uncreased specimen is used to seal over the cup which is used as a tare in the weighing operations. If it is requested that only one side of the sample be exposed to the high relative humidity or if there is some obvious reason for so selecting one side—e.g., if only one side is heat sealing—nine speci-

mens are used; four creased and four uncreased specimens are tested with the specified or obviously appropriate side at the high relative humidity, and one specimen is used on the tare cup.

The sample sheets from which the specimens are to be cut are selected by a good sampling technique. The required number of 4-inch squares are cut from the sheet thus selected, or are sampled as well as possible from the available sheets. Four of these squares are creased. The outline of the ultimate specimen disk is marked on the creased and uncreased squares by laying the metal disk on each square and drawing a pencil line around it. Scissors are used to cut along the pencil line, leaving an ear (*see* Fig. 5) attached to the specimen so that it can be hung from a clip during the conditioning period without damage to the area to be tested. The specimens are conditioned in the testing room for at least 12 hours before being sealed to the cups.

The top edges of the crystallizing dishes are covered with a thin film of the wax mixture by dipping the edges into a shallow pond of molten wax and holding them there until the wax has thoroughly heated and wet the glass for a distance of 3 to 5 mm. up the side of the dishes. The dishes are then removed and allowed to drain; a thin film of wax is left along the side and edge. This operation corresponds to tinning metal to be soldered and, when the specimens are later sealed to the dishes, a good bond between wax and glass is assured.

The following operations are all carried on in the testing room, conditioned at 100° F. and 23% relative humidity.

Sealing Specimens to the Cups

It is convenient to use at least four templates for the sealing operation in order to speed up the process. The templates are placed upon a level table, and the annular groove is lubricated with petrolatum applied with a cloth or brush. The central area of the template is carefully wiped to remove any petrolatum. The ear is trimmed from the specimen and the specimen is placed symmetrically on the template with the side which is to be exposed to the lower relative humidity next to the template. A new waxed-paper box is filled with approximately 25 ml. of the saturated solution of ammonium dihydrogen phosphate and is placed on the specimen. A previously prepared crystallizing dish is labeled, by writing the specimen number on the inside wall of the disk with a china-marking pencil, and is gently placed symmetrically over the specimen. The cup is left in this position for 5 minutes to allow the partial vapor pressure to build up to some extent, and then the 500-gram weight is placed on the dish to hold it firmly in contact with the specimen. The pipe is filled with the molten wax mixture at a temperature of about 105° C., and the wax is quickly forced into the groove in the template so as to form a bead around the edge of the

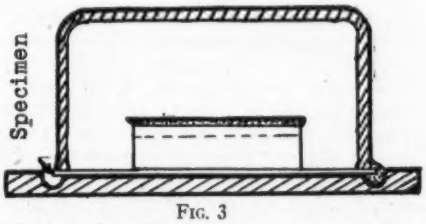

Fig. 3
Template, Specimen, Paper Box Containing Solution, and Crystallizing Dish during the Sealing Operation

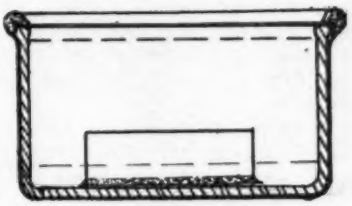

Fig. 4
Assembled Cup before Band of Scotch Tape has been placed around the Wax Bead

specimen; this bead is made thick enough to cover the side of the dish for a distance of 2 to 4 mm. from the specimen. Any air bubbles at the surface of the molten wax are broken. The position of the template, specimen, waxed-paper box, and crystallizing dish during the sealing operation is schematically illustrated in Fig. 3. The wax is allowed to harden thoroughly—e.g., for 10 minutes—when a gentle twist of the dish loosens it from the template and it may be lifted. The dish is then quickly turned right side up to let the paper box fall to the bottom and allow the solution to run over the bottom of the dish. The operation of flipping the dish from the inverted to the normal position must be done expertly in order to avoid splashing drops of the solution onto the specimen.

The specimen is sealed to the tare cup in the same manner, except that the paper box of solution is not used (cf. Fig. 4).

The wax bead is lightly wiped with a cloth to remove any excess of petrolatum. A strip of ½-inch Scotch tape is wound around the (sticky) wax bead to protect it from accidental handling during subsequent weighing operations. Figure 5 is a photograph of a completed cup. This completes the preparation of the specimens, and the cups are then placed on the shelves.

Weighing of the Specimens and Calculation of Water Vapor Permeabilities

The cups are weighed for the first time on the day following their preparation, and, thereafter, are weighed daily or at 2-day intervals, depending upon the rate at which they lose weight. The tare cup is always used.

The total loss in weight of each cup is calculated from day to day from the recorded weights. The periodic weighings are continued until the plot of loss in weight against elapsed time (i.e., time subsequent to

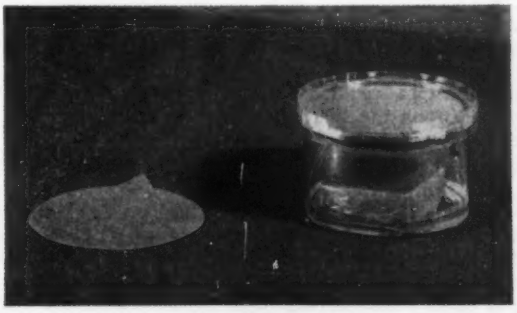

Fig. 5
Assembled Cup and Specimen showing the "Ear" by which the Specimen is hung during the Conditioning Period

first weighing) becomes satisfactorily linear. If the loss in weight is expressed in milligrams and the time in hours, the slope of the linear portion of the curve is the rate of water vapor transfer through the specimen in milligrams per hour. This value, multiplied by the ratio of 100 to the effective specimen area in square inches, yields the rate of transfer in milligrams per hour per 100 square inches of specimen. Division of this rate by 1000 and multiplication by 24 yields the water vapor permeability in grams per 24 hours per 100 square inches. Multiplication of this value by 15.5 converts the water vapor permeability to grams per 24 hours per square meter. For the cups used at the Institute, the factor by which the slope of the curve (i.e., the rate of transfer in milligrams per hour per specimen) is multiplied to obtain the water vapor permeability in grams per 24 hours per 100 square inches is 0.257.

The average values for the group of creased specimens and for each group of uncreased specimens exposed with a particular side toward the high relative humidity are calculated. The average, maximum, and minimum values are reported for each group. All values are reported to the nearest 0.01 gram per 24 hours per 100 square inches unless the value is less than 0.01 gram per 24 hours per 100 square inches, when the value is reported to the nearest significant figure.

Variation in the Test Conditions for the Water-Resistance Test

Samples intended for use as outer wraps which may come in contact with water may be tested for water resistance, or water vapor permeability with water in contact with one side, by using water in the waxed-paper box instead of the saturated solution of ammonium dihydrogen phosphate. When the specimen has been sealed to the cup, the cup is first turned right side up to empty the water out of the box and is then turned over again so that the water covers the specimen. The cup is held in this position against the edge of the shelf by means of a rubber or some other elastic band, so that the specimen is freely exposed to the air of the room. The other conditions of the test, the weighing, and the calculations are the same as described above.

II. Comments on the Individual Steps and Features of This Procedure

Testing Room

It is possible to control the testing room without the conventional and expensive control equipment. The temperature may be controlled by a laboratory-type thermoregulator [e.g., a Central Scientific Company bimetallic thermoregulator *(18)* or by a Fenwal thermoswitch *(19)*], which operates a relay controlling electric radiant heaters. The number of 500-watt heaters required for a particular room will depend upon the thermal insulation of the room and the temperature conditions external to the room. Two or three heaters (1000 to 1500 watts) seem adequate for an ordinary laboratory if any outside walls have reasonable thermal insulation. The heaters should be placed directly in the air stream from one or more of the circulating fans, in order that the heat may be quickly and uniformly distributed about the room. It is good practice to adjust the heat supply to the room, so that the heaters are on and off approximately equal lengths of time.

The relative humidity of the air may be controlled by circulating the air over calcium chloride. The arrangement used at the Institute is a Hartmann dehydrator *(20)*. It is understood that this equipment is no longer being manufactured. However, an improvisation should prove satisfactory. A sheet-metal box acts as a hopper for the calcium chloride and, through holes in the bottom of the hopper, five rows of removable perforated metal tubes project downward. The calcium chloride from the hopper falls or is tamped into these tubes, and a 16-inch fan forces air from the room around them and through an ordinary air filter. As water vapor is absorbed from the air of the room, the saturated solution of the salt which is formed trickles down the outside of the tubes to a tray. This tray may be emptied by hand at necessary intervals or may be directly connected to a drain. With reasonably frequent tamping of the calcium chloride into the tubes, such an arrangement will maintain a closed 3200-cu. ft. room at a relative humidity below 25% during summer weather, even when the room has not been specially treated to reduce the transfer of water vapor into it. The circulating fans should be turned off when calcium chloride is added to the hopper or tamped into the tubes. This dehydrator may be automatically turned on and off as needed by the relative humidity control described in Section III of this report. Manual operation will allow control to $\pm 2\%$ in relative humidity without a great deal of inconvenience. During cold weather when the normal indoor relative humidity is low, it may be necessary to add water to the air rather than remove it. The necessary amount is small, and exposing a relatively small water surface in the room will provide the required amount of moisture.

In addition to the fan which circulates the air over the calcium chloride, it is advisable to have the equivalent of two or three ordinary 10-inch fans in the room to circulate and mix the air thoroughly, thus insuring uniformity of temperature and relative humidity throughout the room.

Cups and Ammonium Dihydrogen Phosphate Solution

The 90 by 50-mm. crystallizing dishes fit on the pans of many analytical balances. In some cases it is necessary to spread the bows which support the pans in order that the wax bead around the edge of the specimen is not rubbed. The total weight of cup as employed in the test is of the order of 130 grams. A balance with a capacity of 200 grams, therefore, is desirable.

There is an air gap of approximately 1.25 inches between the surface of the solution in the cup and the specimen. In Instrumentation Studies XLIV *(15)*, it was pointed out that the resistance to the diffusion of water vapor offered by this thickness of stagnant air is so small, as compared with the resistance offered by a specimen of good water vapor resistance, that the relative humidity of the air next the specimen is essentially that of the air next the solution, and a negligible error in the observed permeability is caused by the presence of this air gap. This is not the case for specimens of very poor water-vapor resistance; in such cases, the rapid transfer of vapor through the specimen will cause the relative humidity of the air next the specimen to be lower than that of the air next the solution, so that the relative humidity and vapor pressure differences across the specimen will be less than the nominal values and spuriously low permeabilities will be observed. How-

ever, for permeabilities of the order of those of the greatest interest at the present time—i.e., permeabilities of 1 gram per 24 hours per 100 square inches, or less—the presence of the air gap between solution and specimen does not introduce an appreciable error. For the same reasons, the presence of the waxed-paper box floating on the solutions does not appreciably affect the observed permeabilities for materials of good resistance, particularly when the boxes have the blotter stock surface to act as wicks.

The saturated solution of ammonium dihydrogen phosphate is a particularly satisfactory one to use because the equilibrium relative humidity over that solution changes relatively little with temperature. It was found that changing the temperature from 90° to 108° F. changed the equilibrium relative humidity by about 2.3%. At 90° F., the relative humidity over the solution was 91%; at 108° F., it was 93.3%.

TABLE I.—WATER-VAPOR PERMEABILITY DATA

Sample	Water-Vapor Permeability g./24 hr./100 sq. in. Uncreased Readings	Uncreased Av.	Creased Readings	Creased Av.
1	0.26			
	0.25			
	0.23			
	0.32	0.27		
2	0.07		0.13	
	0.07		0.12	
	0.06		0.13	
	0.07	0.07	0.11	0.12
3	0.20		1.03	
	0.13		0.71	
	0.17		0.82	0.85
	0.15	0.16		
4	0.22			
	0.26			
	0.20			
	0.36	0.27		
5	0.10		1.34	
	0.10		1.45	
	0.09		1.31	1.37
	0.05	0.09		
6	0.05		0.07	
	0.06		0.06	
	0.03	0.05	0.07	0.07
7	0.13		0.17	
	0.15		0.15	
	0.12	0.13	0.16	0.16
8	0.09			
	0.07			
	0.06			
	0.07	0.07		
9	1.90			
	1.64			
	1.83			
	2.24	1.90		
10	0.03			
	0.04			
	0.04			
	0.04	0.04		
11	0.08		0.16	
	0.05		0.10	
	0.06		0.13	0.13
	0.06	0.06		
12	2.42			
	2.63			
	3.03			
	2.87	2.74		
13	5.23			
	4.36			
	3.84			
	2.61	4.01		
14	0.31		3.99	
	0.24		3.99	
	0.24		3.65	
	0.21	0.25	4.08	3.93
15	1.32		1.23	
	1.03		1.27	
	1.09		1.76	
	1.00	1.11	1.64	1.48
16	0.12		0.15	
	0.15		0.21	
	0.14		0.23	
	0.13	0.14	0.18	0.19
17	3.52		6.60	
	3.12		5.24	
	4.94	3.86	5.33	5.72
18	1.09		9.12	
	1.05		8.97	
	2.67		8.51	
	2.42	1.81	9.00	8.90
19	16.35		16.86	
	15.47		15.42	
	5.22		32.46	21.58
	11.67	12.18		
20	0.18		0.24	
	0.21		0.24	
	0.19		0.22	
	0.20	0.20	0.23	0.24
21	0.06		0.19	
	0.05		0.13	
	0.06		0.17	
	0.06	0.06	0.14	0.16
22	0.17		7.29	
	0.26		2.42	
	0.21		7.56	5.76
	0.27	0.23		
23	0.01		4.83	
	0.01		4.34	
	0.005		4.57	
	0.004	0.008	3.86	4.40
24	0.13		0.21	
	0.12		0.21	
	0.11		0.24	
	0.11	0.12	0.21	0.22
25	0.02		0.05	
	0.03		0.06	
	0.03		0.05	
	0.03	0.03	0.06	0.06
26	0.10		0.27	
	0.10		0.24	
	0.11	0.10	0.25	0.25
27	6.63			
	7.52			
	7.19			
	7.97	7.33		
28	0.71		0.85	
	0.68		0.85	
	0.83		1.16	
	0.89	0.78	1.20	1.02
29	0.41		0.39	
	0.74		0.47	
	0.69		0.81	
	0.30	0.56	0.61	0.57
30	0.85		2.07	
	0.81		1.36	
	0.85		1.26	
	0.71	0.81	1.41	1.53
31	0.13		0.21	
	0.13		0.30	
	0.11		0.21	
	0.13	0.13	0.23	0.24
32	1.34		10.43	
	1.50		9.96	
	1.27	1.37	11.50	
			10.48	10.59

Upon the completion of a test, the wax bead and specimen are pulled off the cup, the wax is melted and then filtered into the stock wax container, the salt solution is returned to the storage bottle, the waxed-paper box is discarded, and the crystallizing dish is washed. It has been found that, after several months of such operation, the relative humidity in equilibrium with the stock solution is essentially unchanged. Only C.P. chemical and distilled water are employed in making up the original solution.

It was found that the inside diameters of the crystallizing dishes varied from 86 to 89 mm., with a large percentage ranging between 87 and 88 mm. The effective area of the specimen is determined by the diameter of the dish; consequently, the dishes must be culled to eliminate those which diverge too widely from the average, or the calculations of water-vapor permeabilities must be based upon the individual areas of the cups rather than upon the average area.

Effectiveness of the Wax Seal

The effectiveness of the wax seal is indicated by the fact that specimens of such impermeable materials as laminations including metal foil show only random changes in weight of the order of 1 or 2 mg. over long periods of time. Cups to which glass plates had been sealed likewise showed only random changes in weight.

Occasionally a specimen will wrinkle or cockle badly because of the unequal expansion or contraction of laminations exposed to high and low relative humidities. When the wrinkles extend into the seal, the suspected points are covered with hot wax. The addition of wax, of course, causes a break in the curve relating the change in weight to the elapsed time. If the seal had previously leaked, the slope of the curve at times subsequent to the repair will be

less than at earlier times. Only on rare occasions has the seal leaked, even with badly wrinkled specimens.

SAMPLING AND CONSISTENCY OF RESULTS

The necessity of employing a good sampling technique in selecting specimens for the testing of any property of paper needs no emphasis. In testing water vapor permeability, the time and work involved, as well as the constant pressure for immediate results, often tempts, if not forces, the technical man to employ an inadequate number of specimens. Actually, the elapsed time necessary for a test is but a little longer when a large number of specimens of each sample is used than when only a few specimens are employed. The chief restriction is usually the lack of equipment and the lack of conditioned space. The method described in this report is of particular interest in this regard, as the only essential limit upon the number of specimens and the number of samples which can be tested at one time is that of laboratory personnel. A testing room of reasonable size will allow the testing of several hundred specimens at one time, if the available personnel can prepare the specimens, carry on the weighing, and make the calculations.

Table I lists the water vapor permeabilities for a number of samples as obtained by the method described in this report. The individual values for each specimen, as well as the average value for each sample, are shown; both creased and uncreased specimens are included. The samples listed have been selected at random from a total number several times larger and, therefore, the tabulated values should present an average picture of the agreement between results for individual specimens of a sample.

It is of interest to observe the flexibility of the various samples, as indicated by the relative values for the creased and uncreased specimens.

III. Cabinet Operation of the Water Vapor Permeability Testing Procedure

The procedure used in the conditioned testing room may be adapted to cabinet operation with somewhat less convenience and the addition of several additional steps. The conventional constant temperature cabinet of suitable size may be used. It should have a window for observation and armholes with sleeves attached. The analytical balance should be placed on the cabinet with a light wire or chain running from the hook from which the pan is normally suspended through a hole in the base of the balance case and through a hole in the top of the cabinet. A balance pan or other device for holding the specimen cup is suspended from this wire or chain. Thus, the cups may be weighed without removing them from the conditioned cabinet. The fan or fans which circulate air in the cabinet must be turned off during the weighing operation. The cabinet can be controlled in temperature by the usual laboratory thermoregulator which operates a suitable number of ordinary incandescent lamps acting as heaters. The relative humidity can be controlled by placing in the bottom of the cabinet a large tray containing a saturated solution of calcium chloride or other suitable salt; the choice of salt will depend on the outside relative humidity. During the summer, when the normal relative humidity is high, calcium chloride should work satisfactorily and maintain a reasonably vapor-tight cabinet at a relative humidity near 23%. The equilibrium relative humidity over a saturated calcium chloride solution at 100° F. is about 19.5%. The closeness of approach to this value in the cabinet depends upon the rate at which vapor leaks into the cabinet from the room and upon the effectiveness of contact between air in the cabinet and the surface of the solution. The exposed area of the solution and the rate of air circulation over the solution may be adjusted to yield the desired relative humidity in the cabinet. During the winter, when the room relative humidity is low, another salt solution may be necessary or the room humidified sufficiently to maintain a leak of vapor from the room into the cabinet. Automatic control may be effected by the means suggested in the following section.

The cups should not be prepared in the room at ordinary temperatures and then introduced into the cabinet. As the air in the cup rises from room temperature to the temperature of the cabinet, the pressure inside the cup will increase. This increase will be determined by the air permeability and extensibility of the specimen. There is danger of unduly stressing the specimen and the wax seal. There will be an added stress because of the increase in the partial water vapor pressure inside the cup as the temperature rises. Therefore, it seems highly desirable that the specimens be sealed to the cup in an auxiliary cabinet maintained at the same temperature as the testing cabinet; no control of relative humidity would be necessary. This cabinet would not need armholes with sleeves, because the temperature can be maintained, even with a fairly large opening in the cabinet, if the circulating air is properly directed around the opening.

IV. Electric Hygrometer Control of Relative Humidity

The electric hygrometer described by Dunmore (*21*) has proved to be a convenient and satisfactory device for controlling the relative humidity in a room or cabinet. The application of this hygrometer in the form of a sword hygrometer for measuring the relative humidity within packages was described in Part II (*16*) of this report. Evans and Davenport (*22*) have described an interesting modification of the instrument designed by Dunmore.

For a number of months, an electric hygrometer element constructed according to Dunmore's description has been used in conjunction with an alternating current Wheatstone bridge recorder to maintain a relative humidity of 90% in a room maintained at 100° F. for package testing. Switches attached to the slide-wire drum of the recorder control an electric janitor (a motor control of the type used to operate the draft and damper of a furnace), which opens or closes a lever-operated gate valve in a steam line opening to the room. In general, the relative humidity of the room ranges within ± 0.5% of the desired value. Occasionally, variations up to± 1.0% occur. The variations are due principally to variations in temperature, which is controlled to ± 0.5° F.

Another hygrometer and recorder have been used to control a room at various relative humidities ranging from 20 to 80%. In both cases, the hygrometer was coated with a more concentrated solution of lithium chloride than that suggested by Dunmore for the relative humidity of interest. The recorders required a greater current than was proposed by Dun-

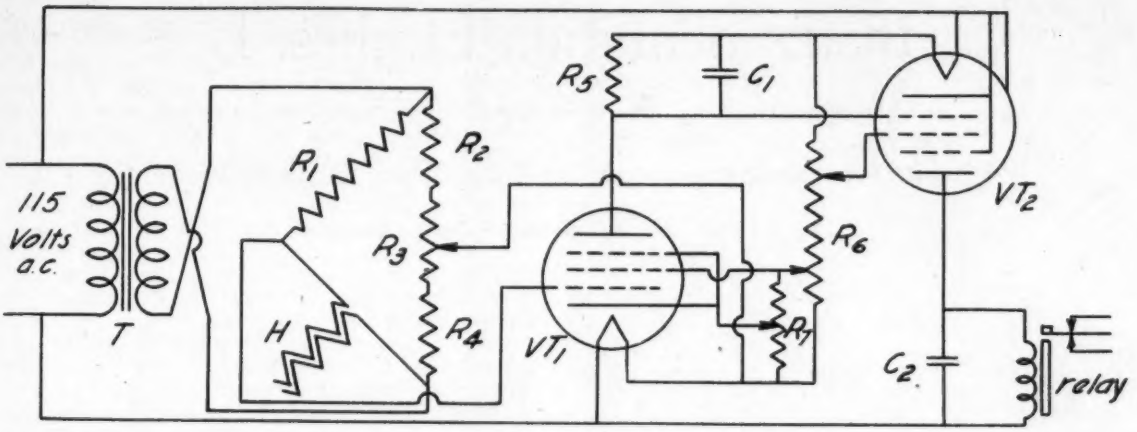

FIG. 6

Diagram of Vacuum-Tube Amplifier Circuit used in Controlling Relative Humidity. T Isolation transformer—e.g., radio receiver interstage coupling transformer. H. Dunmore electric hygrometer. R_1 Fixed resistor (2 watt), of a resistance approximately equal to that of hygrometer at desired relative humidity. R_2, R_4 100,000-ohm, 2-watt resistor. R_3 100,000-ohm radio receiver volume control, linear taper. R_5 1-megohm, 2-watt resistor. R_6 300-ohm, 50-watt adjustable resistor. R_7 2000-ohm potentiometer. VT_1 6J7, 6SJ7, or 6SJ7-GT vacuum tube. VT_2 25A6 vacuum tube. C_1 0.1-microfarad, 200-volt paper condenser. C_2 8-microfarad, 250-volt electrolytic condenser. Relay, one make and one break contact, operates on 10-15 milliamperes

more as a maximum, but their behavior appears satisfactory in spite of the heavier current.

A solenoid valve would be preferable to the electric janitor-gate valve combination, as it would open instantly as compared with the slower response of the janitor motor.

Figure 6 shows the circuit of a simple vacuum tube amplifier which may be used, in conjunction with suitable relays, as the controlling mechanism in place of the recorder. The circuit, exclusive of the Wheatstone bridge and isolation transformer, is essentially that described by Shepard (*23*). In the circuit of Fig. 6, a single hygrometer element will be satisfactory over a wider range of relative humidity than is indicated by the curves of Dunmore's paper. However, it will be found desirable to change elements when making large changes in the relative humidity at which the room or cabinet is controlled. For best sensitivity, the resistance R_1 should be approximately equal to the resistance of the hygrometer element at the desired relative humidity. The relay shown in Fig. 6 has make and break contacts suitable for operating an electric janitor using a three-wire system. If a solenoid valve or other mechanism requiring appreciable power is to be operated, this small relay should in turn operate a power relay which would control the solenoid valve or other device.

Instead of controlling a steam valve, the recorder or amplifier can control dehumidifying equipment, air flow, or any other operation required in the particular relative humidity control problem.

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TAPPI Notes

The New England Section of TAPPI and the Connecticut Valley Div. of the Superintendents Association will meet jointly at the Roger Smith Hotel, Holyoke, Mass., on Friday and Saturday, January 21-22, 1944. Following the TAPPI dinner on Friday evening, there will be a continuation of the discussion at the December meeting, held in Boston on reutilization of waste paper. Special attention at this meeting will be given to fiber disintegration. The discussion will be led by A. E. Bachmann of the Missisquoi Corporation, assisted by Ollie W. Nessner of the Robertson Paper Box Company, R. W. Pattison, American Writing Paper Co., Charles B. Muzzy of E. D. Jones Co. and Robert F. Vokes, Dilts Machine Company. Mr. Vokes will talk on the use of the Hydrapulper in the Continuous Separation of waste paper stock at the superintendents meeting there will be a round table discussion on color led by Ivar Ekholm of the National Aniline and Chemical Company.

H. Ainsworth Harrison, chairman of the Technical Section of the Papermakers' Association of Great Britain and Ireland has recently been elected to the board of the Associated Paper Mills, Ltd. Dr. Harrison is also chief chemist and a director of Cooke & Nutall Ltd., a director of the British Milk Cartons, Ltd.

Instrumentation Studies. L*

Penetration of Papers by Water Vapor. IV.

Procedure for Creasing Specimens for Water Vapor Permeability Testing

By the Staff of The Institute of Paper Chemistry

Abstract

A method of creasing a protective film or a paper which may be readily duplicated is proposed to standardize one of the conditions of test for water vapor permeability.

The practical necessity of creasing a protective film or paper in applying it to or in a package makes it essential to evaluate the protective quality of the material after it has been creased. Because of the impossibility of exactly simulating in the laboratory all the folds and creases which a film or paper may experience in actual use, it is properly expedient to employ a single creasing procedure which is conveniently duplicable by any operator in any laboratory, and which produces creases of sufficient severity to allow samples of excellent and of poor flexibility to be distinguished easily. In other words, the creasing should be of such severity that the most flexible samples are slightly reduced in protective quality, whereas samples of poor flexibility are reduced greatly in quality.

The following procedure for creasing is the outgrowth of a study of several possible methods. It is recommended as a procedure which is easily duplicable and which appears to be of suitable severity for the films and papers used for wrapping and bag making. The ratio of total length of crease to area of the specimen is greater than that found in actual packaging.

The creasing is effected by placing the lightly folded specimen under a weight. The creasing weight has a flat bottom, and the load is adjusted to exert a force of 6 pounds per inch of crease—e.g., for creasing 4-inch square specimens, the creasing load is 24 pounds. A flat metal plate is employed for supporting the specimen during the creasing operation. This plate must be strong enough to retain its flatness under the creasing load. Figure 1 is a photograph of the creasing device.

The specimens are selected by good sampling procedure so as to be typical of the sample and comparable to the specimens to be tested in flat or uncreased condition. The specimens are cut into squares of such size that, subsequent to creasing, specimens of suitable size for water-vapor permeability testing may be cut from them. The edges are parallel to the principle directions of the sheet.

Method

The specimens are conditioned, and the creasing is carried on in the paper testing laboratory which is conditioned at 73° F. and 50% relative humidity. Two adjacent edges of the square specimen are marked off into ¾-inch intervals. The divisions are symmetrically spaced about the center of the specimen area by placing the marks so that there is an equal number on each side of the middle of the edge being marked and so that the mid-point of the edge falls half-way between two marks. The specimen is then folded parallel to one of the sheet edges at the first mark on one side of the specimen, and the fold is creased *lightly* by pressing a ruler on the fold. The creasing weight is tilted and the folded specimen slipped under the weight to a position at which the line of fold lies under the center of gravity of the weight. The weight is *gently* lowered to rest on the specimen, where it is left for 15 seconds and then removed. The sheet is opened and is folded and creased parallel to the first fold at the next mark on the edge of the sheet; this fold is made about the side of the sheet opposite to that about which the first fold was made. This process is repeated until creases have been made through all the marks on one side of the sheet. The sheet appears like an extended camera bellows or an accordion. The entire process is repeated to produce a similar set of creases parallel to the other sheet direction, so that the two sets intersect at right angles. The disks for water vapor permeability testing are cut symmetrically from these creased squares. The center of the disk should lie on the center of the middle square of the creased sheet. A creased specimen, as it appears before trimming to disk shape, is shown in Fig. 1, at the right A specimen which has been creased in only one direction is shown at the left.

This procedure yields an effectively constant ratio of total length of crease to area of 2.55 $in.^{-1}$ for circular water-vapor permeability specimens ranging from 9 to 21 square inches in area. This ratio increases slowly as the specimen area increases and reaches the limiting value of 2.67 $in.^{-1}$ for infinitely large specimens. The ratio decreases as the specimen area is decreased. When it is desired to crease speci-

* This report is one of a series issued as a part of the Instrumentation Program of the American Paper and Pulp Association.
Part II of this series appeared in Paper Trade J. 116, no. 24:16-18; 117, no. 1:12-15 (June 17, July 1, 1943). Part III is Instrumentation Series XLIX.
A part of this material was presented at the Army and Navy Requirements Conference of the Technical Association of the Pulp and Paper Industry, Palmer House, Chicago, Ill., Sept. 21-24, 1943.

FIG. 1

mens having areas outside the range specified above, the proper spacing of the creases to yield the ratio of 2.55 in.$^{-1}$ may be found by geometrical construction using the "trial and error" technique. The smaller the specimen, the more accurately must the proper spacing of the creases be achieved in practice in order to approach satisfactorily the specified ratio.

Typical values of water vapor permeability obtained for uncreased specimens and for specimens creased by this procedure are presented in Instrumentation Studies XLIX.

A recent publication by Schmidt (*1*) describes a creasing method for evaluating paper for use in envelopes. In that method, the strip of paper is formed into a loop and cylinder rolled lengthwise along the loop to crease the paper. The effective creasing load is approximately 6 pounds per inch of crease. It is interesting that creasing techniques independently developed for different purposes should employ the same creasing load.

For another purpose, there was occasion to measure the tensile strength of creased and uncreased strips cut from machine-made bags of laminated material. Sheets of the materials from which the bags were made were also available. Specimens were creased by the flat weight method described above, and the tensile strengths of the creased and uncreased specimens of these materials were determined. The creased specimens were cut so that the creases were perpendicular to the length and near the middle of the strip. The ratio of average creased to uncreased strengths for the bag samples and the flat samples are shown in Table I.

TABLE I.—COMPARISON OF COMMERCIAL AND LABORATORY CREASING

Sample	Tensile Strength Ratio Creased/Uncreased	
	Bag Specimens	Flat Specimens
A	0.99	0.76
B	0.77	0.95
C	0.93	0.98
D	0.96	0.85
E	0.97	0.94
F	1.00	0.98
G	0.93	0.96
H	0.96	1.01
I	0.64	0.89
J	0.90	0.99

The tensile strength ratios for the ten bag samples show a range from 0.64 to 1.00; the range in values for the samples creased in the laboratory range from 0.76 to the same upper limit. Thus, the severity of the laboratory creasing operation was of the same general degree as that of a good commercial bag-making operation.

This method of creasing is being proposed as a TAPPI Tentative Standard.

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Delaware Valley TAPPI Discusses Paper Machine Ventilation

The Delaware Valley Section of the Technical Association of the Pulp and Paper Industry met at the Engineers Club, Philadelphia, Pa., Friday evening, January 7th. W. M. Shoemaker of the Douglas T. Sterling Company presided as Chairman assisted by Jacob Edge of the Downington Mfg. Company as program chairman. About 100 attended. The speaker was W. K. Metcalf of the J. O. Ross Engineering Company who talked on "Air on the Paper Machine."

Mr. Metcalf said, in part:

"The function of air around the paper machine is to carry away the moisture. The engineering of an air system involves handling the minimum, yet adequate amount of air to take care of the moisture liberated, and replacing this volume in the most effective manner.

The starting point in any calculation dealing with air on the paper machine is the exhaust required. The exhaust required is dependent on a number of factors. The first, of course, is production of the machine. Obviously, a small production machine will require less air than a machine with twice the production or many times the production. The production is one of the factors that is known with a fair degree of accuracy.

The wet end is an important factor of the exhaust too often overlooked. The amount of moisture given off at the cylinders, or the fourdrinier, and other sources which give off moisture at the wet end, have to be included. It may surprise you to know that the amount of moisture liberated at the wet end is from 8 to 17% of the total amount handled at the drier section.

The moisture content in the sheet going on the first drier has a direct relation to the amount of exhaust required. The moisture content going on the first wet end drier may vary from 48 to as high as 90%, depending on the product and equipment used. Likewise, the moisture leaving the last drier in a much less important measure, has a bearing on the exhaust. Common leaving conditions range from 8 to 2% moisture content on the oven-dry basis.

Probably one of the greatest factors in miscalculating the proper exhaust for a particular machine is the uncertainty of the moisture content going on the first drier. Most mills have tests for each roll or bundle of paper, which, at least, gives an indication of the conditions on the machine. Unfortunately, these tests are usually taken at the leaving end and the methods employed, in most cases, are crude and of doubtful value for very accurate information. In addition, the conditions across the sheet may vary widely. The operator can learn much from accurate tests on the sheet at the entering end of the machine.

The importance as far as calculating an exhaust volume is concerned, in ascertaining with a fair degree of accuracy the entering moisture, can be clearly illustrated by pointing out that it takes 25% more air to take care of a sheet having 70% going on the first drier than it does for a sheet having 65% moisture going on when that sheet leaves the last drier at 7% moisture in each case. One or two per cent inaccuracy may throw the air calculations off considerably.

Another factor which influences the exhaust is the

amount of moisture added on the size roll or some similar process in the dryer section. The sheet may be dried down to say 5% moisture, and in passing through some auxiliary process, have water added to around 25 to 30%. This additional moisture must be taken care of by the exhaust system.

In spite of these factors, the air on the paper machine can be determined quite accurately if one other thing is known, namely, grains pickup. Pickup is nothing more than the amount of moisture increase which entering air picks up before leaving There are 7000 grains per pound of water. A cubic foot of air exhausted from a paper mill may contain anywhere from 8 to 20 grains. When you realize that for each pound of paper there may be from 0.9 to 8.8 pounds of water per pound of paper, you can see how many cubic feet of air are required to carry away the moisture liberated from the paper making process. In fact, for each ton of paper there may be say 2.5 tons of water to take care of. This represents perhaps 60 tons of air to be handled. It is easy to see why air is a very important factor in any paper mill and an expensive factor as well, particularly if care is not taken in properly handling this volume. Outside conditions have a definite effect on the grains pickup. Outside air in general will have the smallest number of grains per cubic foot in winter, and increase in number during the summer months. If the leaving air from the machine room has the same number of grains per cubic foot the year round, obviously the pickup is greater when the grains entering is at a minimum.

It is an easy matter to check what the conditions actually are for the leaving air. By means of a wet and dry bulb thermometer the conditions can be readily seen from the psychrometric chart. For instance, for 130° dry bulb and 105° wet bulb, the chart shows a relative humidity of 40%, a dewpoint of 101° a total heat of 81 B.t.u. per pound, having 310 grains per pound and 15.9 cu. ft. per pound. Dividing these latter two figures gives 19.5 grains per cubic foot. If, for instance, the entering air has 2.5 grains per cubic foot, the pickup through the mill is 17 grains.

Knowing the above factors, the total exhaust volume can be calculated. This volume is fixed, and must be taken care of, and there are no short cuts, no matter how much the operator or management tries to avoid the realities of the situation.

Every c.f.m. that is exhausted has to come into the mill by one means or another. Proper handling of supply air to the machine room is just as important as exhausting.

The temperature in the machine room cannot be so high that it is unbearable for the operators. One way of returning a part of the large volume of air is to take care of the operators by making conditions in and about the mill ideal. There are several mills where this has already been done and the day is not too far distant when all mills will supply enough cool, dry air around the machine area to make the conditions around the machine the most livable of any place in the mill.

The relative humidity of the leaving air should be maintained as high as is practicable, since the number of grains pickup for the same dry bulb temperature will be considerably higher as the relative humidity increases. To obtain a high relative humidity, the vapors around the machine area should be properly caught and as closely confined as possible. In addition, the vapor which forms a skin effect on the surface of the paper, and which is caught in the pockets formed by the sheet passing over the dryers, must be cleared out in the most efficient and effective manner possible.

If the machine has top and bottom felts, not only must the pockets be cleaned out, but the felt itself should have the moisture driven out of it in the most effective manner.

The dew point indicates the lowest possible temperature at which the machine room conditions can be lowered without condensation taking place. All of us agree that it is impractical to place an expensive machine and equipment where it might be exposed to a rainstorm or heavy fog. However, unless the temperature of the air next to the roof is above the dewpoint, there will be constant dripping, and unless the conditions are above saturation, the room will be foggy. Any moisture that is condensed from the vapor while still in the machine room, eventually has to be evaporated again and carried out.

The total heat of the exhaust volume is large. It is necessary to maintain a fairly high wet bulb temperature in order to carry away the moisture. The higher the wet bulb temperature, the greater the total heat. The total heat consists of latent heat, sensible heat and superheat. It is good economy to endeavor to recover as much of this heat as possible. There are two ways of recovering a portion of this heat; one is to use as much of this heat as can be salvaged for heating the incoming air required to carry away the moisture. The other is to heat the makeup water to the plant or heat the white water in the plant.

Air on the paper machine is a very important subject for paper mill technical men and much consideration should be given to the proper handling of air through your particular mills. By far, the greatest weight of material handled in a mill, at the drier section of the paper machine, is the air used. For instance, in a year's time a 60 ton mill will produce, say 18,000 tons of paper, requiring the use of 1,080,000 tons of air. One of the chief functions of the technical men will be to see that their plants are properly taking care of these huge quantities.

Among those present were: Edw. J. Albert, Paul C. Baldwin, Arnold J. Barea, R. M. Bates, Wm. L. Baumner, Jr., D. A. Beiswinger, Chris F. Bingham, A. L. M. Bixler, Samuel M. Bratton, K. W. Britt, W. J. Burke, J. D. Clark, C. M. Connor, L. W. Crouse, Thage Dahlgren, W. Dempsey, John Dering, George H. Detwiler, W. P. Dohne, Jos. W. Dinter, H. W. Donnelly, Amos Dotterer, J. Edw. Doyle, Paul Easton, Jacob Edge, John Fachet, Harrison J. Farra, John E. Gambol, E. N. Glauner, Jesse Good, Lois V. Hans, J. C. Harper, Jr., A. M. Hartley, C. W. Hoffman, H. F. Hoffman, Harry Hulmes, V. Jacobsen, George T. Lane, N. H. Langhrey, Geo. J. Lockban, R. G. Macdonald, Geo. B. Martin, Wm. D. Marshall, H. McCane, H. C. Merritt, W. K. Metcalfe, Lewis B. Miller, Albert Moerman, W. Morehouse, George Moxley, A. H. Nadelmann, Joseph A. Paciello, E. S. Petze, M. B. Pineo, J. E. Plumstead, E. N. Poor, R. J. Proctor, William G. Putney, H. F. Ray, M. D. Reuben, C. H. Rice, C. W. Rivise, John Roslund, C. J. Ryder, J. Carl Schmidt, Edw. A. Shallcross, Wm. A. Shoemaker, Charles A. Shubert, Jay Smith, E. J. Street, George M. Suydam, Richard N. Temple, G. C. Walton, Kingdon R. Watt, A. E. Waugh, R. Wiggins, Ray Wilcox.

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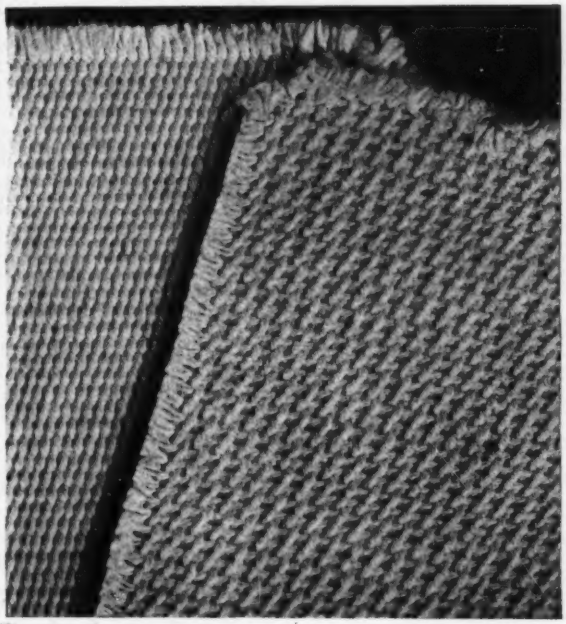

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New York Paper and Pulp Market Review

Orders For Paper Continue Heavy—WPB Sets Goal of 14,000,000 Cords For 1944—OPA Adjusts Light Weight Kraft Papers Upward — Salvage of Waste Paper Higher — Rags Active — Other News.

Office of the PAPER TRADE JOURNAL.
Wednesday, January 12, 1944.

Orders for paper in the wholesale market continue to be reported above current supply and facilities for delivery. New uses for paper as substitutes for scarcer materials and heavy demand, particularly for container and fiber board to meet war requirements, is reported from many quarters. Reports from some of many manufacturers' representatives, jobbers, and general paper merchants this week, reflect the opinion that civilian requirements in some kinds of paper under the WPB limitation orders, will be in less adequate supply this year. The re-use program for the conservation of containers has done much to relieve the short civilian supply. So much tonnage of paper board is going overseas, however, that a substantial part of this essential material cannot be re-used or reclaimed as waste. The drive for more containers, as well as for all usable waste paper, should be continually stressed to increase collections.

The index of general business activity for the week ended January 1, declined to 141.8, from 148.2 for the preceding week, compared with 136.8 for the corresponding week for 1943. The index of paper board production was 124.8, compared with 142.2 for the preceding week, and with 131.6 for the corresponding week for 1943.

Paper production for the week ended January 1 was estimated at 72.1%, compared with 73.6% for 1943, with 102.2% for 1942, with 80.8% for 1941, and with 61.4% for the corresponding week for 1940.

Paper board production for the week ended January 1 was 63.0%, compared with 62.0% for 1943, with 86.0% for 1942, with 59.0% for 1941, and with 48.0% for the corresponding week for 1940.

The price schedule of lightweight kraft wrapping papers has been increased by the Office of Price Administration. Increases range from 5 cents to $1 per hundred weight, applicable only to standard, No. 1 and super-standard grades. The new prices cover only basic weights from 35 to 18 inclusive. Prices of basic weight 40 pound paper remain unchanged.

Wood Pulp

The WPB has set a goal of 14,000,000 cords of pulpwood for 1944, excluding approximately 1,500,000 cords of imported wood. The U. S. pulp industry is estimated to have received over 16,000,000 cords of pulpwood in 1943, and receipts from Canada declined sharply when imports from the Dominion were cut 25%.

Pulpwood receipts from Russia totaled 16,000 cords in 1943, but no doubt can be increased very substantially if the current victory pulpwood campaign does not promise to bring out sufficient wood.

Rags

Mill buying of all papermaking grades of cotton cuttings is reported active at this date, with prices strong at ceiling levels.

Mill buying of old cotton rags of the roofing grades is currently heavy. Reports from some quarters indicate that demand is again rising well above supplies.

Old Rope and Bagging

Trading in scrap bagging continues light. No improvement in activity has been reported after the holidays. Prices are still nominal.

Old Waste Paper

The urgent need of more waste paper should be emphasized as critical. Every person should make an effort to contribute to the "collect more waste paper" drive, which must be maintained so long as the present short supply situation continues.

A huge tonnage of needed waste paper is still being burned. The WPB has set 8,000,000 tons as its salvage goal, calling for collections of 115,000 weekly. Current collections are running at about 115,000 tons a week.

Collections are increasing, according to the waste material trades, but shortage of labor continues to be a difficult problem to solve.

Twine

No important change in the twine market has been reported at this date. Demand is active for all available grades of twine and cordage. Prices are well maintained.

TAPPI Topics

The Technical Association still has a supply of its booklet "Paper—The Lifeblood of Civilization". These were prepared to promote good public relations for the industry and should be distributed as far as possible. Anyone wishing copies for this use, for example, to distribute to high school seniors or to service clubs may obtain them from R. G. Macdonald, Secretary, Technical Association of the Pulp and Paper Industry, 122 East 42nd street, New York 17, N. Y. The only charge for this publication will be that for express.

William P. Dohne, formerly of the Rising Paper Company is now chemical engineer for W. C. Hamilton & Sons, Miquon, Pa.

Raymond P. McGinley, formerly of Crane & Co. is now chemical engineer for W. C. Hamilton & Sons, Miquon, Pa.

The Southern Pulp and Paper Journal, Atlanta, Ga., has become a sustaining member of the Technical Association of the Pulp and Paper Industry. The Journal was founded in 1938 and is published by Ernest H. Abernethy Publishing Company, for executives, engineers, superintendents, chemists and operating men of the southern states, in particular. Ernest H. Abernethy is president of the company, established in 1925 which publishes, in addition to the Journal: Southern Printer, Southern Stationer, Southern Advertising and Publisher, Southern Garment Manufacturer, Southern Canner and Packer and Southern Jeweler. Vincent F. Waters, formerly technical assistant to the Secretary of TAPPI is editor.

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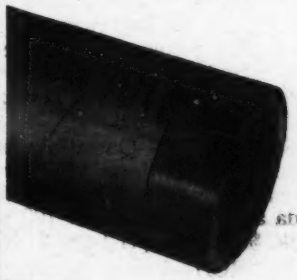

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MISCELLANEOUS MARKETS

Office of the PAPER TRADE JOURNAL.
Wednesday, January 12, 1944.

BLANC FIXE—Quotations on blanc fixe continue unchanged at prevailing market levels. The pulp is currently quoted at $40 per ton in barrels, at works; the powder is offered at $60 per ton f.o.b., works. Demand reported fair for the week.

BLEACHING POWDER—No change is reported in the market for bleaching powder. Current demand reported good. Bleaching powder is currently quoted at $2.50 per 100 pounds, in drums, at works.

CASEIN—OPA maximum prices on processed acid-precipitated casein are as follows: 10,000 pounds or more, 24 cents per pound; 2,000 pounds, 24¼ cents per pound; less than 2,000 pounds, 24¾ cents per pound, f.o.b., shipping point. Imported, 10 cents per pound, f.o.b. source.

CAUSTIC SODA—Prices on caustic soda are reported unchanged. Supply for the current week continues tight. Solid caustic soda is currently quoted at $2.30 per 100 pounds; flake and ground at $2.70 per 100 pounds, in drums, at works.

CHINA CLAY—Quotations on china clay are firm and continue unchanged. Demand reported fair for the current week. Domestic filler clay is currently quoted at from $7.50 to $15 per ton; coating clay is quoted at from $12 to $22 per ton at mine. Imported clay is quoted at from $13 to $25 per long ton, ship side.

CHLORINE—Market situation on chlorine unchanged. Government demand for war use continues heavy. Prices firm. Chlorine is currently quoted from $1.75 per 100 pounds, in single-unit tank cars, f.o.b., works.

ROSIN—Quotations on some grades of rosin are higher for the current week. "G" gum rosin is currently quoted at $4.08 per 100 pounds in barrels, Savannah. "FF" wood rosin is currently quoted at $4.02 per 100 pounds in barrels, New York. Seventy per cent gum rosin size is currently quoted at $4.34 per 100 pounds, f.o.b., works.

SALT CAKE—Prices on salt cake are unchanged. Demand reported fair for the current week. Domestic salt cake is currently quoted at $15 per ton in bulk; chrome salt cake at $16 per ton. All prices in car lots, f.o.b., shipping point.

SODA ASH—Quotations on soda ash are firm and continue to conform to prevailing market quotations. Demand heavy shipments rather slow. Quotations on soda ash in car lots, per 100 pounds, are as follows; in bulk, $.90; in paper bags, $1.05; and in barrels, $1.35.

STARCH—Prices on corn starch are unchanged for the current week. Supply situation continues tight. Pearl is currently quoted at $3.10 per 100 pounds; powdered starch at $3.20 per 100 pounds. All prices in bags, car lots, f.o.b., Chicago.

SULPHATE OF ALUMINA—Quotations on sulphate of alumnia are firm. Supply satisfactory for the current week. The commercial grades are currently quoted at $1.15 per 100 pounds; iron free at from $1.75 to $1.85 per 100 pounds, in bags, car lots, fo.b., works.

SULPHUR—Prices of sulphur are firm and continue to conform to prevailing market quotations Annual contracts are currently quoted at $16 per long ton, f.o.b., mines. Spot and nearby car lots are quoted at $18 per ton.

TALC—Prices on talc are firm and continue unchanged at prevailing market prices. Domestic talc is currently quoted at from $16 to $21 per ton, at mills. No quotations on imported talc.

MARKET QUOTATIONS

All market quotations, excepting those otherwise designated as official OPA maximum prices, are based on the manufacturers' price level as of October 1-15, 1941; maximum wholesale prices are based on the merchants' maximum prices for stipulated quantities at a quoted price to all customers of a like class, as shown by the merchant's sales records of goods delivered during March, 1942. A merchant's price list in effect in March 1942, showing quotations of actual shipments, will establish the current maximum prices.

Paper

(Delivered New York)

News, per ton—

Roll, contract	*$58.00	@	—
Sheets	64.00	"	—

* OPA Maximum Price.

Kraft—per cwt.—Carload Quantities Zone A, f.o.b. Mill

Superstandard Wrapping	*$5.25	@	—
No. 1 Wrapping	*5.00	"	—
Standard Wrapping	*4.75	"	—
Standard Bag	*4.375	"	—

* OPA Manufacturers' Prices.

Tissues—Per Ream—Carlots

White No. 1	1.12½	"	—
White No. 1 M. G.	1.10	"	—
White No. 1½	1.00	"	—
White No. 2	.90	"	—
Anti-Tarnish M.F.	1.20	"	—
Colored	—	"	—
Kraft	.95	"	—
Manila	.90	"	—

Toilet—1 M. Sheets—Per Case

Unbleached	4.25	"	—
Bleached	5.70	"	—
Unbl. Toilet, 1 M.	4.16	"	—
Bleached Toilet	5.70	"	—

Paper Towels, Per Case—

Unbleached, Jr.	2.60	"	—
Bleached, Jr.	3.20	"	—

Manila—per cwt.—C. l. f. a.

No. 1 Jute	11.25	@	—
No. 1 Manila Wrapping, 35 lb.	6.00	"	6.25
No. 2 Manila Wrapping, 35 lb.	5.75	"	6.00

Boards, per ton—

News	*48.00	@	—
Chip	*48.00	"	—
Sgl. Mla. Lt. Chip	*60.00	"	—
White Pat. Coated	*75.00	"	—
Kraft Liners 50 lb.	*63.00	"	—
Binders Boards	84.00	"	116.00

* OPA Base Prices per 10 tons. Less than 10 tons but over 3 tons, add $2.50; three tons or less, add $5; regular 35-39 basis, add $5.; basis 40-49, add $2.50; basis 91-100, add $2.50; basis 101-120, add $5.

The following are representative of distributors' resale prices:

Rag Content Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds	Ledgers
100% Rag Ext.		
No. 1	$39.10@$46.00	$40.25@$47.25
100% Rag	32.20 " 37.75	33.35 " 39.25
85% Rag	.... "	29.90 " 35.00
75% Rag	23.00 " 27.00	24.15 " 28.25
65% Rag	.... "	22.80 " 27.75
50% Rag	18.70 " 22.75	19.90 " 24.25
25% Rag	16.40 " 20.00	17.55 " 21.50

Colors at $1.00 cwt. extra.

Sulphite Bonds and Ledgers—White, Assorted Items. Delivered in Zone 1:

	Bonds	Ledgers
No. 1	$10.55@$12.75	$11.70@$14.25
No. 2	9.65 " 11.75	10.80 " 13.25
No. 3	9.20 " 11.25	10.35 " 12.50
No. 4	8.90 " 10.75	10.05 " 12.25

Colors $1.00 cwt. extra.

Free Sheet Book Papers—White, Cased Paper. Delivered in Zone 1:

No. 1 Glossy Coated	$13.65	@$15.50
No. 2 Glossy Coated	12.40 "	14.00
No. 3 Glossy Coated	11.60 "	13.25
No. 4 Glossy Coated	11.15 "	12.75
No. 1 Antique (watermarked)	10.25 "	11.75
No. 2 Offset	9.60 "	11.00
A Grade E. F.	9.35 "	10.75
A Grade S. & S. C.	9.60 "	11.00
B Grade E. F.	8.85 "	10.25
B Grade S. & S. C.	9.10 "	10.50
C Grade E. F.	8.55 "	9.75
C Grade S. & S. C.	8.80 "	10.00
D Grade E. F.	8.25 "	9.50
D Grade S. & S. C.	8.50 "	9.75

Ivory & India at $.50 cwt. extra.

Wood Pulp

OPA Maximum Prices and Canadian Manufacturers Prices, Less Freight, Not Exceeding OPA Allowances.

Bl. Softwood Sulphite	$76.00
Unbl. Softwood Sulphite	65.00@ 66.00
Bl. Hardwood Sulphite	73.50
Unbl. Hardwood Sulphite	63.50
Bl. Mitscherlich	81.00
Unbl. Mitscherlich	72.00 @ 82.00
N. Bleached Sulphate	86.00
S. Bleached Sulphate	79.00
N. Semi-Bleached Sulphate	82.00
S. Semi-Bleached Sulphate	75.00
N. Unbl. Sulphate	73.00
S. Unbl. Sulphate	63.50
Bl. Soda	66.00
Unbl. Soda	62.00
Groundwood	46.00

Transportation Allowances Applying to Producers of Wet Wood Pulp.

	Below 50% Air Dry Weight
Northeast	$13.50
Lake Central	13.50
Southern	16.00
West Coast (in area)	10.50
West Coast (out area)	16.50

	50% 80% Air Dry Weight
Northeast	$11.50
Lake Central	11.50
Southern	14.00
West Coast (in area)	9.50
West Coast (out area)	15.50

Applying to Producers of Dry Wood Pulp.

	Above 80% Air Dry Weight
Northeast	$8.50
Lake Central	8.50
Southern	11.00
West Coast (in area)	7.50
West Coast (out area)	13.50

Should freight charges actually exceed these allowances, the difference may be added to the maximum prices

Domestic Rags

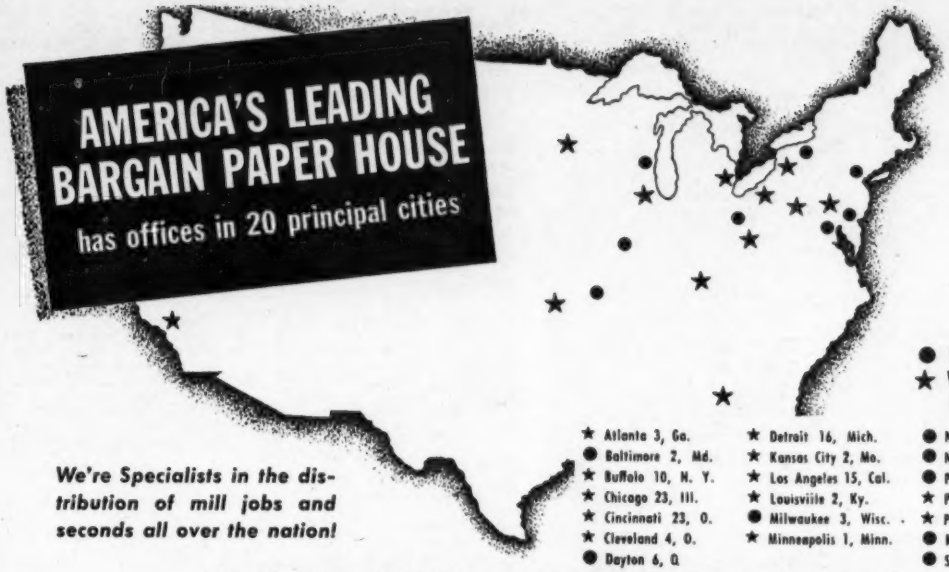
New Rags

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—

New White, No. 1	6.50	@	7.25*
Silesias No. 1	—	"	5.75*
New Unbleached	6.75	"	7.50*
Blue Overall	—	"	5.50*
Fancy	—	"	3.50*
Washables	—	"	3.00*
Bleached Khaki Cuttings	—	"	4.25*
Unbleached Khaki Cuttings	—	"	3.50*

* OPA Maximum Prices.

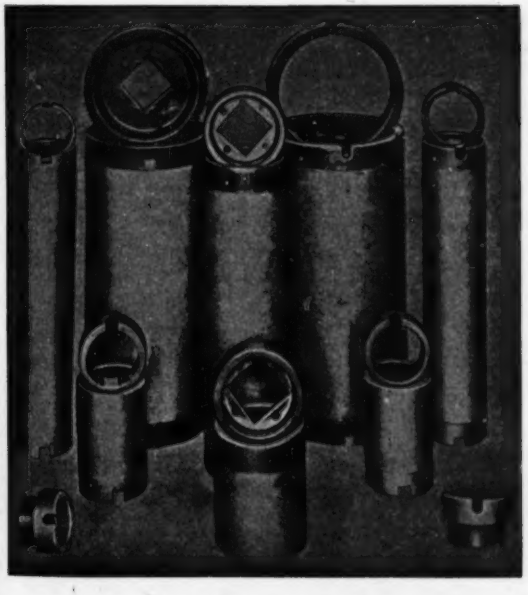


● Sales Office
★ Warehouse and Sales Office

★ Atlanta 3, Ga.
● Baltimore 2, Md.
★ Buffalo 10, N. Y.
★ Chicago 23, Ill.
★ Cincinnati 23, O.
★ Cleveland 4, O.
● Dayton 6, O.
★ Detroit 16, Mich.
★ Kansas City 2, Mo.
★ Los Angeles 15, Cal.
★ Louisville 2, Ky.
● Milwaukee 3, Wisc.
★ Minneapolis 1, Minn.
● Newark 4, N. J.
● New York 13, N. Y.
● Peoria 5, Ill.
★ Philadelphia 4, Pa.
★ Pittsburgh 22, Pa.
● Rochester 4, N. Y.
● St. Louis, Mo.

We're Specialists in the distribution of mill jobs and seconds all over the nation!

THE SABIN ROBBINS
PAPER COMPANY · CINCINNATI 23, OHIO
PURCHASING OFFICES: Detroit 16, Mich., and 41 Park Row, New York 7, N. Y. • SALES OFFICES in 20 Principal Cities
NATIONAL DISTRIBUTORS OF PAPER MILL JOBS



ELIXMAN

CAPS

Straight wound paper cores made in sizes from 2" to 10" inside diameter with any thickness wall required.

Long draw protected slot caps of heavy gauge steel in all standard sizes.

Heavy duty caps with reenforced square hole. This patented feature of reenforcement gives added strength and durability.

CORES

Samples of caps or cores will be gladly submitted

ELIXMAN PAPER CORE COMPANY, INC.
CORINTH, N. Y.

Old Rags

White, No. 1—			
Repacked	*3.80	"	—
Miscellaneous	*3.20	"	—
White, No. 2—			
Repacked	*2.90	"	—
Miscellaneous	*2.65	"	—
Third and Blues—			
Repacked	*2.20	"	—
Miscellaneous	*1.80	"	—
Roofing Rags—			
No. 1	*1.55	"	—
No. 2	*1.45	"	—
No. 3 (bagging)	*1.35	"	—
No. 4	*1.35	"	—
No. 5A	*1.35	"	—
Old Manila Rope	5.75	"	—

OPA Maximum Prices.

Foreign Rags

All Prices nominal

New Rags

New Dark Cuttings	2.25	@	2.40
New Mixed Cuttings	2.00	"	2.20
New Light Silesias	5.50	"	5.75
Light Flannelettes	5.50	"	5.75
New White Cuttings	7.00	"	7.50
New Light Oxfords	4.00	"	4.50
New Light Prints	3.00	"	3.25

Old Rags

No. 1 White Linens	7.50	"	8.50
No. 2 White Linens	6.50	"	7.50
No. 3 White Linens	4.50	"	—
No. 4 White Linens	2.25	"	3.25
No. 1 White Cotton	4.25	"	4.75
No. 2 White Cotton	3.25	"	3.75
No. 3 White Cotton	2.50	"	3.00
No. 4 White Cotton	1.90	"	2.20
Extra Light Prints	2.00	"	2.40
Ord. Light Prints	1.75	"	2.15
Med. Light Prints	1.55	"	1.95
Dutch Blue Cottons	2.25	"	2.50
French Blue Linens	3.00	"	—
Checks and Blues	2.00	"	—
Linsey Garments	1.90	"	2.00
Dark Cottons	1.50	"	1.60
Old Shopperies	1.30	"	1.45
New Shopperies	1.45	"	1.50
French Blues	2.25	"	2.50

BAGGING

(Prices to Mill, f. o. b. N. Y.)

Gunny No. 1—			
Foreign	Nominal		
Domestic	4.25	@	4.35
Wool Tares, light	4.25	"	4.50
Wool Tares heavy	4.50	"	5.00
Bright Bagging	4.50	"	4.85
Manila Rope—			
Foreign	—	"	—
Domestic	*5.75	"	—
Jute Threads	5.50	"	—
No. 1 Sisal Strings	*4.00	"	—
Mixed Strings	2.00	"	—

* OPA Maximum Price.

Old Waste Papers

(F. o. b. New York)

OPA Maximum Prices

No. 1 Hard White Envelope Cuts, one cut	3.37½	@	—
No. 1 Hard White Envelope Cuts	3.12½	"	—
No. 1 Hard White Shavings, unruled	2.87½	"	—
No. 1 Hard White Shavings, ruled	2.50	"	—
Soft White Shavings, one cut	2.87½	"	—
No. 1 Soft White Shavings	2.50	"	—
Soft White Shavings, Misc.	2.15	"	—
No. 1 Fly Leaf Shavings	1.67½	"	—
No. 2 Fly Leaf Shavings	1.12½	"	—
No. 1 Groundwood Fly Leaf Shavings	1.25	"	—
No. 2 Mixed Groundwood Fly Leaf Shavings	.90	"	—
Mixed Colored Shavings	.75	"	—
Mixed Groundwood Colored Shavings	.90	"	—
Overissue Magazines	1.67½	"	—
No. 1 Heavy Books & Magazines	1.67½	"	—
Mixed Books	.85	"	—
No. 1 White Ledger	2.17½	"	—
No. 2 Mixed Ledger, colored	1.87½	"	—
New Manila Envelope Cuttings, one cut	2.87½	"	—
New Manila Envelope Cuttings	2.65	"	—
Extra Manilas	1.85	"	—
Mixed Kraft, Env. & Bag Cuttings	2.75	"	—
Kraft Envelope Cuttings	3.25	"	—
Triple Sorted, No. 1 Brown Soft Kraft	2.50	"	—
New 100% Kraft Corrugated Cuttings	2.25	"	—
No. 1 Assorted Old Kraft	1.75	"	—
New Jute Corrugated Cuttings	.90	"	—
Old 100% Kraft Corrugated Containers	1.75	"	—
Old Corrugated Containers	1.15	"	—
Box Board Cuttings	.72½	"	—
White Blank News	1.65	"	—
Overissue News	.85	"	—
No. 1 News	.75	"	—
No. 1 Mixed Paper	.70	"	—
Old Corrugated Containers	.82½	"	—
Mill Wrappers	.85	"	—

Twines

All Prices Nominal

(F. o. b. Mill)

(Soft Fiber)

Coarse Polished—			
India	.21	@	—
White Hemp	.21	"	—
Fine Polished—			
Fine India	.26	"	—
Unpolished—			
Box	17½	"	—
Paper Makers	.17	"	—
Tube Rope	.19	"	—
Wall Paper	.20½	"	—
Wrapping	.23	"	—
Soft Fiber Rope	.19	"	—
Cotton	.25	"	—

(Hard Fiber)

Medium Jays	.18	"	—
Mex. Sisal	.16	"	—
Manila		"	—

PHILADELPHIA

Domestic Rags (New)

(Price to Mill, f. o. b. Phila.)

Shirt Cuttings—			
New White No. 1	.07½	@	.07½
New White No. 2	.04½	"	.05
Light Silesias	.04½	"	.04¾
Silesias, No. 1	.04	"	.04¼
Black Silesias, soft	.03¾	"	.04
New Unbleached	.07½	"	.07½
Washable Prints	.03¾	"	.03½
Washable No. 1	.02	"	.02¼
Blue Overall	.04½	"	.05½
Cottons—According to grades—			
Washable shredding	—	"	.01¾
Fancy Percales	.03¼	"	.03½
New Black Soft	.02¾	"	.03
New Dark Seconds	1.75	"	2.00
Khaki Cuttings—			
No. 1 O. D.	.03	"	.03½
No. 2 Mixed	.02½	"	.02½
Corduroy	.01¾	"	.02¼
New Canvas	.04¾	"	.05¼
New Black Mixed	—	"	.02½

Domestic Rags (Old)

White No. 1—Repacked	3.80	"	—
White No. 2—Repacked	2.90	"	—
Miscellaneous No. 1	3.20	"	—
Miscellaneous No. 2	2.65	"	—
Thirds and Blues—			
Miscellaneous	1.80	"	—
Repacked	2.20	"	—
Black Stockings—			
(Export)	Nominal		
Roofing Stock—			
Foreign No. 1	Nominal		
Domestic No. 1	1.55	"	—
Domestic No. 2	1.45	"	—
Roofing Bagging	1.35	"	—
Old Manila Rope	5.75	"	—

Bagging

(F. o. b. Phila.)

Gunny No. 1—			
Foreign	Nominal		
Domestic	3.00	"	3.50
Sisal Rope	3.75	"	—
Mixed	1.00	"	1.50
Scrap—			
No. 1	3.25	"	3.50
No. 2	1.75	"	1.80
Wool Tares	4.00	"	4.25
No. 1 New Light Burlap	3.00	"	4.00
New Burlap Cuttings	3.75	"	4.00

Old Papers

(F. o. b. Phila)

OPA Maximum Prices

No. 1 Hard White Envelope Cuts, one cut	3.37½	"	—
No. 1 Hard White Shavings, unruled	2.87½	"	—
Soft White Shavings, one cut	2.50	"	—
White Blank News	1.65	"	—
Soft White Shavings, Misc.	2.15	"	—
No. 1 White Ledger	2.17½	"	—
No. 2 Ledger, colored	1.87½	"	—
No. 1 Heavy Books & Magazines	1.67½	"	—
Overissue Magazines	1.67½	"	—
New Manila Envelope Cuttings	2.65	"	—
No. 1 Assorted Old Kraft	1.75	"	—
No. 1 Mixed Paper	.70	"	—
Box Board Cuttings	.72½	"	—
Kraft Corrugated Cuttings	2.25	"	—
Old Corrugated Containers	1.15	"	—
Overissue News	.85	"	—
No. 1 News	1.00	"	—

BOSTON

Old Papers

(F. o. b. Boston)

OPA Maximum Prices

No. 1 Hard White Shavings, unruled	2.87½	@	—
No. 1 Hard White Shavings, ruled	2.50	"	—
Soft White Shavings, Misc.	2.15	"	—
No. 1 Fly Leaf Shavings	1.67½	"	—
No. 2 Fly Leaf Shavings	1.12½	"	—
No. 1 Groundwood Fly Leaf Shavings	1.25	"	—
No. 2 Groundwood Fly Leaf Shavings	.90	"	—
Mixed Colored Shavings	.75	"	—
New Manila Envelope Cuts, one cut	2.87½	"	—
Hard White Envelope Cuts, one cut	3.37½	"	—
Triple Sorted No. 1 Brown Soft Kraft	2.50	"	—
Mixed Kraft Env. & Bag Cuttings	2.75	"	—
Kraft Envelope Cuttings	3.25	"	—
No. 1 Heavy Books & Magazines	1.67½	"	—
New Manila Envelope Cuts, one cut	2.87½	"	—
New Manila Envelope Cuttings	2.65	"	—
White Blank News	1.65	"	—
No. 1 Assorted Old Kraft	1.75	"	—
No. 1 Mixed Paper	.70	"	—
Overissue News	.85	"	—
Box Board Cuttings	.72½	"	—
New Corrugated Cuttings, Kraft	2.25	"	—
Old 100% Kraft Corrugated Containers	1.75	"	—
Old Corrugated Containers	1.15	"	—
Jute Corrugated Cuttings	1.07½	"	—

Bagging

(F. o. b. Boston)

Gunny Bagging—			
Foreign	(nominal)		
Domestic	2.50	@	2.75
Sisal Rope No. 1	*4.75	"	—
Sisal Rope No. 2	*4.25	"	—
Mixed Rope	1.35	"	1.50
Transmission Rope—			
Foreign	(nominal)		
Domestic	2.75	"	3.00
Manila Rope—			
Foreign	(nominal)		
Domestic	5.75	"	—
Soft Jute Rope	5.25	"	—
Jute Carpet Threads	3.00	"	3.50
Bleachery Burlap	8.50	"	9.00
Scrap Burlap—			
Foreign	(nominal)		
Domestic	3.25	"	3.50
Wool Tares—			
Foreign	(nominal)		
Domestic	4.25	"	—
Aust. Wool Pooches	3.75	"	4.00
New Burlap Cuttings	4.75	"	5.00
Heavy Baling Bagging	4.00	"	4.25
Paper Mill Bagging	2.50	"	3.00
No. 2 Bagging	1.35	"	—

* OPA Maximum Price.

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints	.04½	@	.04¾
Fancy Percales	.04¼	"	.04¾
New White No. 1	.06¾	"	.07
New Light Flannelettes	.05½	"	.06
Canton Flannels, Bleached	.06	"	.06¼
Underwear Cutters, Bleached	.06¼	"	.06¾
Underwear Cutters, Unbleached	.05¼	"	.06
Silesias No. 1	.06	"	.06¾
New Black Silesias	.03	"	.03¾
Red Cotton Cuttings	.03½	"	.04
Soft Unbleached	.06½	"	.06¾
Blue Cheviots	.05½	"	.06
Fancy	.02¾	"	—
Washable	.02¾	"	—
Khaki Cuttings	.03¾	"	.04
O. D. Khaki	.03½	"	.04¾
Corduroy	.03¼	"	.03½
New Canvas	.06½	"	.06¾
B. V. D. Cuttings	.06¼	"	.06¾

Domestic Rags (Old)

(F. o. b. Boston)

White No. 1—			
Repacked	3.80	@	—
Miscellaneous	3.30	"	—
White No. 2—			
Miscellaneous	2.65	"	—
Twos and Blues, Repacked	2.20	"	—
Old Blue Overalls	2.25	"	2.50
Thirds and Blues, Repacked	2.20	"	—
Miscellaneous	1.80	"	—
Black Stockings	3.50	"	4.00
Roofing Stock—			
No. 1	1.55	"	—
No. 2	1.45	"	—
No. 3	1.35	"	—
No. 4	1.35	"	—
No. 5, Quality A	1.35	"	—
Quality B	1.20	"	—
Quality C	.95	"	—
Old Manila Rope	5.75	"	—

* OPA Maximum Prices.

Foreign Rags

(F. o. b Boston)

Canvas	(nominal)
Dark Cottons	(nominal)
Dutch Blues	(nominal)
New Checks and Blues	(nominal)
Old Fustians	(nominal)
Old Linsey Garments	(nominal)
New Silesias	(nominal)

CHICAGO

Waste Paper

(F. o. b. Chicago)

OPA Maximum Prices.

Shavings—			
No. 1 Hard White Envelope Cuts, one cut	1.37½	"	—
No. 1 Hard White Shavings, unruled	2.87½	"	—
No. 1 Soft White Shavings	2.50	"	—
Misc.	2.15	"	—
No. 1 White Ledger	2.17½	"	—
No. 2 Ledger, colored	1.87½	"	—
No. 1 Heavy Books & Magazines	1.67½	"	—
Overissue Magazines	1.67½	"	—
New Manila Envelope Cuttings	2.65	"	—
No. 1 Assorted Old Kraft	1.75	"	—
No. 1 Mixed Paper	.70	"	—
Box Board Cuttings	.72½	"	—
Kraft Corrugated Cuttings	2.25	"	—
Old Corrugated Containers	1.15	"	—
Overissue News	.85	"	—
No. 1 News	1.00	"	—
No. 1 White Ledger	2.17½	"	—
No. 1 Heavy Books & Magazines	1.67½	"	—
White Blank News	1.65	"	—
Mixed Kraft Env. & Bag Cuttings	2.75	"	—
No. 1 Assorted Old Kraft	1.75	"	—
Overissue News	.85	"	—
No. 1 News	.75	"	—
No. 1 Mixed Paper	.70	"	—
No. 1 Roofing Rags	1.55	"	—
No. 1 Roofing Bags	1.45	"	—